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*Chairman:* H. ALABASTER.

*Technical Editor:* A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE, M.I.E.E. A.M.INST.C.E. *Commercial Editor:* A. H. BRICCE.

*Manager and Secretary:* E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

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# Standardisation of Production.

"HAS our hand lost its cunning? I venture to think it has not. When you contemplate the development that has taken place in the last ten years . . . . you must feel reassured that we still have in our midst first-class brains." So said Sir Frederick Mills, Bt., before the Iron and Steel Institute on May 7th in his presidential address on "Economics of the Heavy Iron and Steel Industry."

The greater part of the address was confined to the vital question of the costs of production and the effect of the high prices of coal and steel, with particular reference to the low efficiency and high production costs in distributing a small number of orders of very diversified design of product throughout a large number of works of various sizes. We, therefore, make no apology for reminding our readers of the leader in our issue of November 14th, 1924, when we emphasised that in our opinion the first essentials to the revival of trade were cheap coal, iron and steel, and we congratulate Sir Frederick Mills upon so forcibly drawing attention to this question, and especially upon doing so before a body whose members are prominently associated with those fundamental industries.

As Sir F. Mills says, there is no doubt that we still have in our midst first-class brains, but the question we have to ask ourselves, and we think particularly the iron and steel industry, is: Are we making the best use of the whole of them? This country is retaining its position in the electrical industry of the world, as evidenced by the remarks of the chairman of one of our leading electrical manufacturing companies that 50 per cent. of its output last year was for export, this business being obtained against competition with the whole world. Unfortunately, however, it cannot be said that the coal, iron and steel trades are retaining their positions in export trade. This difference between industries is a significant fact which needs explanation, and we venture to suggest that the reason is that the electrical industry since its very inception has been in competition with the most highly efficient electrical manu-

facturers of the world and has, therefore, been obliged to keep its organisation in first-class condition, whereas the coal, iron and steel industry has probably rested on its laurels too long, and allowed its Continental and American competitors to pass it in the matter of organisation.

We admit that still further steps can be taken to improve the electrical industry, but the biggest stimulus to us would be a decreased cost of coal, iron and steel, which, in its turn, would lower the cost of transport. Therefore, as our prosperity is so dependent on these industries, we take the opportunity of again referring to the question of their costs of production, as an insular view must not be taken on industrial questions.

To the advocates of nationalisation we would point out that the difference between the state of the steel industries is not a question of the capitalist system, but one of the ability and capacity of men in all branches of an industry to handle the problem that is before them. This is clearly emphasised by the fact that our electrical industry—a capitalist industry—is able to obtain a good percentage of business from the world's markets, whereas some other capitalist industries are depressed. We suggest, therefore, that the present depression in the coal and iron trades is not a question of "capitalist" system, but, as Sir Frederick Mills suggests, one of organisation.

Sir Frederick contends that 92½ per cent. of the cost of a ton of steel is labour, when brought back to the essentials that we referred to in our previous article, namely, coal and iron ore in the ground, and he says that very few men, including publicists (Parliamentary and otherwise), appreciate this. He stressed this point by saying that he wanted "works managers to regard a ton of steel as nine-tenths labour rather than just a ton of steel." In other words, he considers that works managers, in addition to knowing the technicalities of their work, should also be high-grade men of organising ability above the average; for a modern plant alone will not necessarily produce the cheapest article unless the men and the organisation for running it are of the highest efficiency; we go further and say that where these managers do not sit on the board of their companies they should be added to it, so that their views can be considered when important matters of policy are settled.

We agree with Sir Frederick's suggestion that the range of work in any one establishment should be strictly limited and standardised, and that orders should be concentrated in those works most suitable for their production. "Specialisation is the order of the day, and we must adopt it for the iron and steel industry," says he.

It is well known that plants installed in a number of our great collieries and steel works are the product of the best brains and practice of our electrical industry, but it is an open question whether all the works in which these plants are installed are working at their greatest efficiency. This needs investigation and, as Sir F. Mills says: "Can we not go even further? Is it beyond the wit of those who control our hundred and one iron and steel works to devise means for physical amalgamation of their plants? If such grouping results in greater efficiency, we venture to suggest that this combined with prosperity is of greater use to the country than insane competition and stagnation."

As grouping of each class of work in itself is useless unless men with proved technical and organising ability are directing the works, we sincerely trust that every step will be taken to ensure that first-class organisers are responsible for the control of these plants, and that these experts on production, with their intimate knowledge of the requirements for the low costs of production and knowledge of labour, will largely influence the selling policy of the companies concerned. This, in our opinion, is the most valuable point of Sir F. Mills's suggestion, namely, that an essential requirement in the revival of trade is the standardisation and organisation of production and not only the question of organisation of selling policy, and we suggest that this is a suitable guiding principle for all industries, including our own.

We would again point out that low costs of production do not necessarily mean low wages, and we would again draw attention to the fact that the Ford Co., of America, pays an hourly rate to its men many times that paid in this country, and in spite of this is able, by proper organisation and specialisation in grouping, to produce an article that is cheaper than anything of the same kind produced in this country.

One often reads sentiments similar to those of Sir F. Mills expressed by big public men, but unfortunately the publication in the Press is often the end, and no real steps are taken in the directions indicated. We trust, therefore, that the suggestions of Sir Frederick Mills will be given earnest consideration, and that there are men courageous enough to carry some of those suggestions into practice.

It is a fact that in industry there are men who in the past have handled the problems with ability and distinction, but it does not necessarily follow that they have accommodated themselves to present-day requirements—they should ask themselves this question, and if they are not fully satisfied, they should take immediate steps to strengthen their position by bringing into their counsels young men brought up in the modern atmosphere and who possess the energy and courage to deal with the problems in the light of present-day requirements—the basis is "the organisation of industry for efficient production."

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**American Finance and European Competition.**

In alluding to the large loans that have been obtained in the States by German, Austrian, Swiss, Italian and Japanese concerns for electric public utility and manufacturing concerns, the *Electrical World* complains that these investments in foreign lands are not hedged about with the same safeguards that obtain in America. Such securities for the countries named have amounted to a quarter of a "billion" dollars within the last year. "Prudence," it is remarked, must not be "thrown to the winds," and our contemporary, while not seeking to check foreign investments of the type mentioned, or to sit in judgment on what has been done, suggests that there should be "caution and investigation," the assistance of the State Department or the Department of Commerce being sought in this connection. It seems that it is being urged in Washington that American bankers should attach certain conditions to the use of American money by foreign industrialists. One of these conditions is that no portion of the money shall be expended in certain trade practices; another that Americans shall have an opportunity to tender for supplies to be purchased with the money. By lending money, American bankers are also providing the sinews with which American goods are defeated in foreign markets. Some large German concerns, it is recognised, are obtaining foreign business on the strength of their ability to arrange for the financing of the project in the United States. It is stated that while American bankers recently financed a railway electrification project, all of the equipment was ordered in Germany, and the suggestion is made that only those applications for loans should be favoured which undertake to spend at least a part of the money in the States. The attitude of the bankers, however, is that when ample security is forthcoming, it is contrary to the ethics of banking to attempt to attach conditions as to the proportion to be expended in America. They hold it to be in America's interest that they should assist to restore prosperity to other countries. "Foreign industry must be financed . . . no American industry is being deprived of adequate financing by the loans being made to foreign industries." This attitude is quite intelligible regarded from the purely banking standpoint, but industry cannot be expected to view without concern

the simultaneous placing of capital and contracts in the hands of foreign competitors. Our readers will remember that we referred to this subject at length in our leading article on "International Electrical Relations" (ELEC. REV., February 27th, 1925, p. 321), while Sir Benjamin Longbottom also discussed it in his Beama speech (ELEC. REV., March 27th, 1925, p. 485).

We are not surprised that the subject has been receiving attention in American industrial and financial centres. British engineers will remember how London financiers once raised big loans here to enable German companies to carry out in German factories large electrical plant contracts for works in the British Empire. There was much criticism by those who felt that those who found the money ought also to have a say in directing the course of the contracts that resulted. In some circles it is thought that the bankers should arrange for representation on the boards of the foreign concerns to which they advance loans; this might on occasions be effective in bringing industrial advantage to the country advancing the money, but there seems to be no general sympathy with the idea of imposing inflexible conditions.

It seems to be inevitable that in helping other industrial countries on to their feet we shall strengthen their position as our competitors in trade and industry.

**Electrical Engineering Industry.**

WITH the above comments in mind, it is interesting to note that in a speech recently delivered before the Bradford Engineering Society, Mr. Pybus said that "Our politicians and bankers might be busy putting our competitors on their feet," but he hoped that when they had finished doing that they would have time to look round and put the old country herself on her feet. Bradford, he remarked, would not get back its trade easily when it had to compete against workers in other countries who were working 60 hours a week and receiving half the pay the mechanics in this country were getting. It was, however, gratifying to learn from the speech of the chairman of the English Electric Co., Ltd., Sir Charles Ellis (reported elsewhere in this issue), that that comprehensive concern has been able to build up and strengthen its position in the export trade because the absence of any serious trade dispute in the industry during the last three years has been an important factor in enabling it to meet foreign competition. The company's employés, it was added, had worked loyally and well "at a time when general economic conditions had brought the wage of a skilled craftsman below that of the scavenger in his sheltered trade."

Abroad, said Sir Charles, there were few markets in which the company had been unable to find a sale for its products in world competition. Such remarks, read in conjunction with those uttered by the heads of other British electrical manufacturing concerns, should fill us with optimism in spite of the prevalent depression in other branches of engineering work. Electrical possibilities are not exhausted in any part of the world, and given peaceful conditions in the industry, some of our producers are confident that they can secure further extension of their foreign business.

**The Electrical Development Scheme.**

THE proposals for the extension of the operations of the British Electrical Development Association which were adopted at the recent annual meeting are now being placed before electricity supply undertakings. A brochure has been circulated in which very good reasons are set forth why such undertakings should contribute one-tenth of one per cent. of their revenue to the funds of the Association, enabling it to make headway with efforts which cannot fail to bring benefit to all departments of the industry. The subject receives fuller attention on a later page of this issue. We commend the scheme, the Association, and the appeal to the sympathetic interest of those who have so far invested nothing at all, or less than they ought to have done, in this dividend-earning enterprise.

**Electricity Supply.**

THE electrical event of the week was the ceremonial opening of the Barking power station by the King on Tuesday last; His Majesty's participation in this notable function emphasises the significance of the occasion, which marks an epoch in the history of London's electricity supply. Unfortunately, as we go to Press with these pages whilst the ceremony is still in progress, we must defer extended comment to a later issue.

But for the outbreak of war, the station would have been in operation many years ago, for the County of London Electric Supply Co. obtained authority to erect it in 1913; and but for the passage of the Act of 1919 and the new conditions which resulted from its enactment, the plant would probably have been running in 1922, for the company had the site, the money, and the plans, and was ready in 1920 to proceed with the work the moment the Electricity Commissioners gave their consent. However, the opposition of the London County Council and other municipal authorities, as well as most of the London companies, was successful in deferring consideration of the scheme until the whole question of the supply of electricity in London and the Home Counties was inquired into by the Electricity Commissioners, and it was not until 1922 that the way was cleared for work to begin. The history of the undertaking affords another illustration of the fact that the backwardness of public electricity supply in this country is not due to lack of the engineering skill, or of the capital, or of the will to go ahead, but to the everlasting struggle between public and private enterprise and to legislative obstacles.

Now, however, all difficulties have been overcome, and the company is to be congratulated on the inauguration of a power station of 100,000 kW—a first instalment on the way to an ultimate capacity of 600,000 kW—equipped with the most modern and economical plant, and within reach of an almost unlimited load. Including the cost of the mains, the total outlay has been about 2½ millions sterling. We hope that with this latest example of a "super-station" in its service, the company will be able to demonstrate that efficiency and economy in the broadest sense flow from the policy which has been adopted by the Electricity Commissioners—namely, that of concentration and transmission. By this we mean an ample supply of electricity to the consumer at a low price; for little benefit will be gained by raising the thermal efficiency to 25 per cent. if the consumer is no better off. On Friday last Mr. Baldwin, at Oxford, declared that we paid "infinitely too much" for light and power, and that the discrepancy between what we ought to pay and what we do pay would increase by leaps and bounds unless something were done. He stated that the report of the expert committee—"men of vision and imagination"—was complete, and if accepted by the Cabinet, would be carried into effect in the autumn session of Parliament. We shall look forward to further announcements with keen interest. Whilst we see no difficulty in providing an abundant supply of electricity, we are not so sure that even the most visionary and imaginative experts can make it *cheap* by concentration and transmission. Small undertakings with short mains are supplying electricity to-day to all comers at prices which the big ones cannot approach. If the cheapness is to be attained, as is suggested, by improving the load factor, the prospects are more hopeful.

Whilst going to press we learn with interest that Mr. S. L. Pearce, C.B.E., the well-known and popular head of Manchester Corporation Electricity Supply Department, has been offered an important post in connection with the Government plan for developing and cheapening electricity supply. If he accepts the offer—probably at a material sacrifice—his ripe experience, sound judgment, and administrative capacity will enable him to render yeoman service to the State.

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# The Royal Society's Soirée.

## Annual Exhibition and Demonstrations.

THE Royal Society's annual conversazione was held at Burlington House on the evening of May 13th. Sir Charles Sherrington, O.M., G.B.E., M.D., welcomed Fellows and guests, and demonstrations were arranged as usual for the inspection of visitors. Amongst the 36 exhibits were several of an electrical nature, Prof. W. M. Thornton's miner's electric lamp, arranged to indicate the presence and measure the amount of fire-damp in colliery workings, being of foremost interest. It was shown for the first time, being quite different from the lamp he exhibited at the Institution of Electrical Engineers some time ago, and the extraordinary sensitivity of the device may be gauged from the fact that it is capable of accurately detecting one-tenth of 1 per cent. of gas. The simple and robust detector takes the form of a heating element enclosed in a small perforated metal cylinder, which is attached to the ordinary portable miner's battery lamp, the only modification of the latter being the extension of one terminal and the addition of a third for switching the heater on and off. An adjusting knob is provided, and the number of turns required to switch on the lamp is an indication of the percentage of gas present, or the knob may be set, and the time which elapses before the lamp filament glows after the heater is switched into circuit may be taken as a measure of the amount of gas. For instance, if the filament takes 55 seconds to glow, no gas is present, whereas if the lamp lights in 40 seconds, 2 per cent. of gas is present. Those who know the difficulties of testing for gas with a flame lamp will appreciate the practical value of Dr. Thornton's ingenious invention.

The Cambridge Instrument Co., Ltd., demonstrated applications of the thermal-conductivity method of gas analysis. Various characteristics of the Shakespear katharometer make it suitable for gas analysis in connection with research work: it is a "percentage" instrument with small capacity, so that small quantities of gas can be measured; it has a small time lag, and is direct reading, being very sensitive to certain gases having thermal conductivities differing from one another. These properties were illustrated in the following experiments:—

A very pretty new method of demonstrating the partial separation of two gases from a uniform mixture by introducing a temperature gradient within the gas, which effect was first pointed out by Prof. S. Chapman and called by him "thermal diffusion"; measurement of the respiration of gas from a single insect, *e.g.*, a fly, and of a plant; measurement of water vapour in air by a reaction replacing water by hydrogen; and a simple method of estimating a small quantity (say, one milligram) of $CO_2$ as carbonate in a mixture.

The Thermal Syndicate, Ltd., exhibited a selection of transparent and opaque pure fused quartz apparatus and laboratory equipment; atmospheric mercury-vapour lamps for medical and research work; tungsten-filament lamps with quartz bulbs; bars for electric heaters or resistors; corrugated quartz envelopes for valves 2 ft. 7 in. long by 8½ in. diameter, weighing 7½ lb. each, being the largest one-piece fused quartz articles ever produced, and a naval silica valve for radio telegraphy exhibited by permission of H.M. Signal School, Portsmouth.

The Metropolitan-Vickers Electrical Co., Ltd., had on view examples of electro-deposition, such as specimens showing chromium plating (non-tarnishable), cadmium plating for rust-proofing iron), and heavy nickel deposits (for building up).

An interesting noise frequency analyser was shown. The "noise" to be analysed is picked up by a magnetophone, amplified, and applied to a telephone receiver. A calibrated audio-frequency valve oscillator is arranged to superimpose on the telephone a single determinate frequency which may be varied until beats are heard in the telephone. The formation of beats indicates that the "noise" under analysis has a component frequency which is equal to the oscillator frequency, plus or minus the beat frequency. The apparatus may be employed to determine the one or more predominant frequencies in the noise of a running machine, and from this knowledge the source of the noise may frequently be traced. The apparatus allows of the determination of single note frequencies, and permits also of the analysis of compound and unmusical sounds; the fundamental and the dominant harmonics may be picked up and other frequencies determined with an inaccuracy of less than 1 per cent. An example of such a sound is the noise emitted by gearing. It is often impossible to pick out by ear any particular note, but by the use of this apparatus a fairly complete analysis may be made. The frequency range of the instrument exhibited is about 150-3,000 cycles per second, but the instrument may be made to cover the whole audible range if required.

There were also exhibited examples of low-impedance thermionic valves and parts of special construction having the following advantages:—They can operate with a comparatively poor vacuum, the low impedance being obtained by locating the electrodes close together, whilst the other feature is obtained by confining the electron discharge to short paths, thereby reducing the formation of positive ions. Three methods of confining the electron discharge are available: (*a*) by means of the cool ends or edges of the cathode, (*b*) by increasing the work function of the cathode ends or edges, and (*c*) by the use of electrically-charged shields. In the exhibits, methods (*a*) and (*c*) were illustrated, the grid supports operating as shields.

Prof. MacGregor-Morris and Mr. A. H. Mumford showed a double cube lumen comparator that consists of two identical cubes in contact with one another which are painted inside a matt white, and are otherwise arranged on the lines of globe photometers. The windows in the two cubes are arranged in close juxtaposition, and a standard lamp of known lumen output is placed in one cube, with the lamp to be tested in the other, hence the two adjacent windows are illuminated in proportion to the luminous flux emanating from each. A rotating diaphragm enables the proportion of the illumination coming from the two windows and falling on two other windows fixed in the eyepiece to be adjusted to equality. The angle of rotation of the diaphragm then gives a measure of the ratio of the lumens of the two lamps.

The International Western Electric Co.'s electrical stethoscope is an instrument which fulfils all the functions of an ordinary stethoscope, and provides the following additional facilities:—Any number of persons up to six hundred can listen simultaneously to heart and other body sounds, and by the use of electrical filters sounds of certain frequencies can be cut out or retained, thus allowing the listener to concentrate on sounds of special interest.

An audiometer was on view which enables measurements to be made of the sensitivity of any ear by relating its "threshold of audibility" to that of an average ear as determined by experiment on a large number of persons whose powers of hearing were normal. There was shown an artificial larynx that is intended to restore vocal powers to persons who have had the larynx removed and the trachea terminated at the base of the neck. The company also showed telephotographs, or untouched negatives and prints of photographs transmitted over telephone lines up to 3,300 miles in length.

Amongst Messrs. Adam Hilger's physical apparatus were Lummer-Gehrcke plates of crystalline quartz and a Müller "Universal" X-ray spectograph.

The Research Department, Woolwich, showed a new arrangement of apparatus for the spark photography of bullets in flight, designed for ease in working by the elimination of difficulties due to electrical leakage and by avoiding the necessity to work near the sparking potentials of the spark gaps. The method of actuating the spark at the correct instant makes the use of contact wires unnecessary, thereby allowing photographs of a freely flying bullet to be obtained. Amongst other items was a new method (by X-rays) of showing the orientation of crystals in a metal when in a state of strain (where this cannot be detected by the microscope); X-ray spectra of cordite, illustrating its colloidal nature, and apparatus for determining the flash velocity and pressure factors of ignitory detonators, use being made of the high electrical conductivity of the hot gases formed by the decomposition of the detonator filling. The gases passing through gaps, at specified distances apart, in separate electrical circuits, complete these circuits, the instants of completion being registered by means of an Einthoven galvanometer. For the measurement of the pressure a piezo-electric crystal is utilised. The charge produced on the crystal by the flash pressure is applied to the grid of a balanced valve circuit, and the resulting disturbance of the anode current is recorded by a suitable galvanometer.

The National Physical Laboratory (Mr. J. Hollingworth) had portable apparatus for the measurement of the intensity of long-wave wireless signals on view, similar to the non-portable type designed at the N.P.L. and now in use at four stations in the British Isles for the study of the relation between signal intensity and distance from source. As four points have been found to be insufficient for this purpose, they are to be supplemented by this travelling set, which will enable readings to be taken at any point relative to each transmitting station. Additional items included the use of photo-electric cells of different alkali metals to detect a difference of colour in sources of light (Mr. T. H. Harrison). Before comparing the candle powers of electric lamps photo-electrically, it is essential that they should be run with the same colour distribution, and, in order to obtain the full accuracy of the photo-electric method, the colour matching must be done by a method more sensitive than the visual one. A method of colour-matching has been developed by the staff of the research laboratories of the General Electric Co., Ltd., and is being adopted at the National Physical Laboratory as a preliminary to the accurate standardisation of electric lamps by photo-electric methods. A rubidium and a sodium cell are connected in series, and the photo-electric currents balanced against each other when the two cells are exposed to the illumination of the same electric lamp. If the temperature of the lamp is raised, the sodium cell becomes relatively more sensitive and *vice versa*. By this method lamps can be colour-matched to within 1 deg. K. of the equivalent temperature and within 0.1 per cent. voltage.

The Science Museum showed some early radio apparatus.

# Motor-Starting Equipment.

## The Lack of Standardisation.

By FRED. W. DAVIES.

The desirability of more uniformity of practice regarding motor-starting equipment is obvious. Think of the difference of opinion as to whether a single-phase starter ought to have a definite "start" position, or to have its starting resistance graduated like a direct-current starter; the inconsequent way in which three-phase motor starters are equipped with one, two, or three overload trip coils, and sometimes without any at all (when fuses are used); and, in the case of direct-current motors, the widely different sizes of the starters used for any given power. These things are indications that finality, at any rate, has not yet been attained, and the *raison d'être* of this article.

Much of the disparity in these matters is due to the customer's demand for price paring, rather than to any serious difference of opinion among electrical engineers. It is a truism to say that all starting gear (like the motors themselves) should be designed and constructed with a view first and foremost to efficient and trouble-free service. The question of cost ought obviously to come last of all; and this, not from merely academic considerations, but for sound commercial reasons, for the use of inferior and unsuitable starting gear frequently results in breakdowns and loss amounting to many times the initial cost of the gear involved.

Unfortunately, it is not always easy to convince the customer of this. Usually he is a man of ripe business experience: he already knows better than the salesman could tell him the meaning of the five or ten per cent. which he will save by buying the cheaper article, and his business instinct weighs heavily on the side of "buying in the cheapest market." He probably does not know the reason for the difference in type, and those refinements in detail, on account of which another firm is asking a higher price; and one need not wonder if he rejects the better article even though it may have cost to make, and honestly be worth, twenty per cent. more. The salesman who offers the better and more complete equipment is perforce an educationist, and the odds are all against him—on the customer's first order.

The interests of the consumer are paramount, seeing that he is the ostensible reason for the existence of the supply authority, the contractor, and the manufacturer. What, then, are his requirements so far as electrical starting gear is concerned? Clearly, the first essential of such gear is that it shall be capable of starting the motor frequently and economically, and without undue deterioration of either itself or the motor for which it is installed. It should protect the operators of the driven machinery by being fitted with a device to prevent the motor re-starting unexpectedly after an interruption to the supply, although this is not specifically called for in the Home Office Regulations. There should be incorporated in the starter or associated with it such current-limiting devices as will protect the motor against being injuriously overloaded, and thereby incidentally obviate the risk of fire which might conceivably ensue under certain circumstances. It is desirable, also, that in the event of a fault occurring in the motor, the overload device should serve to give warning of it, and prevent further damage. The conditions and requirements being different in the respective cases of single-phase, polyphase, and direct-current equipments, it will be necessary to consider each of them on its merits.

### Starters for Single-phase Motors.

Single-phase motors of the induction type, whether with squirrel-cage or wound rotors, require a starter of the phase-splitting type. In its simplest arrangement, and for the smaller sizes of motors, this starter takes the face-plate form, though for motors of, say, above three horse-power the drum type of construction is better. It is likely that the drum type will ultimately win its way into favour on account of its inherently more robust construction, just as it has established itself as the more satisfactory type for two- and three-phase work.

It is usually considered desirable for the motor to run up to nearly its synchronous speed on the "start" notch before being switched over to the "load" posi-

tion. There is much to be said, however, in favour of designing motor and starter so that the motor attains a speed of, say, only about two-thirds of its synchronous speed on the "start" notch. On these lines it will be found possible so to design the motor and starter that the motor will start from rest more positively and reach this limited speed more quickly than when designed on more orthodox lines. There is, of course, a more perceptible "kick" of the current when switching over to "load"; but provided it does not exceed the initial "kick," this is not objectionable. In short, more positive starting of the motor may be obtained in this way at the price of two "kicks" of current instead of one.

A starter of the graduated type, in which the resistance is cut out step by step, as in the case of a direct-current starter, is sometimes called for when the motor is required to work on a sensitive supply. With this type of starter—necessarily of the face-plate type—it is expedient to wait at the first, or nearly the first, contact until the motor is well on its way to synchronism, when the remaining resistance may gradually be cut out. The demand on the supply mains with a graduated starter is, if handled properly, more gradual and therefore less perceptible than with a starter having two definite positions only. If, however, the resistance is cut out too quickly, not only will more current be taken, but the phase difference between the two motor windings will actually be reduced. This in turn will cause the motor to slow down, when it will take still more current and eventually stop. It is not uncommon for the sector contact or bar for the starting circuit to be of such a length that the starting winding is in circuit until the switch arm is nearly on the last contact. When this is the case, the phase difference between the two windings becomes less and less as the resistance is cut out of circuit, and beyond a certain point the action of the starting winding is actually to retard the motor. Starters of this type frequently fail to function properly for this reason. A shorter bar, or even a single small contact, should be provided for the starting winding; one then lingers over the first few contacts until the motor has got well started, when the remaining resistance may be cut out more quickly, the motor meanwhile accelerating evenly, and with rapidly-decreasing current consumption.

Where a number of single-phase motors is installed, and when circumstances permit, the largest motor might be used as a master machine for starting the others. This motor only need be equipped with the conventional starting gear, the others being started with the assistance of current from the starting winding of the first motor, which will be in quadrature with the primary supply current.

Single-phase motors of the slip-ring type, of course, require only a two-position phase-splitting starter for the stator, in conjunction with a graduated resistance starter for the rotor, the two being preferably interlocked. It was pointed out in a former article* that a no-volt release is not strictly necessary for the protection of single-phase motors, particularly of the smaller sizes; the fuses (or overload release, as the case may be) not only limit the current, but should the supply be interrupted and the starter inadvertently be left in the running position, will serve to cut off the current immediately the supply is resumed.

### Two-phase and Three-phase Starters.

For the smallest sizes of motors a starter is usually dispensed with, the motor being started direct from the mains. Some form of current-limiting device is always necessary, however, and may for such motors take the form of a triple-pole fuse. The objection to fuses for polyphase work is that, should a momentary overload result in the blowing of only one of the fuses, the motor will continue to run, functioning as a single-phase machine, with the result that the windings of one phase become overheated by reason of the abnormal load thus thrown upon them, and will probably burn out. In small motors the limiting short-circuit current is low, and they are therefore not so liable to damage in this way as are the larger motors; and their first cost is so low compared with the cost of more effective protective gear that it is not worth while to incur the cost of such gear.

The larger motors require a more elaborate form of starting and protective gear in order to avoid sudden and undue electrical and mechanical stresses, and to minimise disturbance in the electricity supply system. The most elementary form of starter is one having a simple non-inductive resistance in each phase of the stator winding, the resistance being cut out gradually by means of a switch of the well-known face-plate form. This type of starter is crude, inefficient, and liable to breakdown. The only points in its favour are the somewhat smoother starting which it affords, and the more insidious way in which it makes its extravagant demands on the mains.

The star-mesh starter (or its counterpart in the case of two-phase motors, the series-parallel starter) is a much more robust apparatus, especially when made as it usually is of the drum type. Although its action is somewhat harsh, owing to there being only two live positions, it has the advantage that all the energy taken from the mains is used in the motor; and it has therefore a starting efficiency which is about 50 per cent. better than the stator resistance type for a given starting torque. The star-mesh starter, fitted with the necessary no-volt and overload trip coils, is good and satisfactory for motors of medium size.

It should be noted that the star-mesh starter is not an exact equivalent of the auto-transformer starter (or compensator, as it is sometimes called) with a 58 per cent. tapping. With an auto-transformer the open-circuit secondary pressure will (on account of the reactive and ohmic drops in its windings) usually fall from 10 to 15 per cent. when the motor is first switched on, and rise gradually to a value approximating the open-circuit pressure as the motor gains speed. This valuable feature of the auto-transformer starter is not always fully appreciated; it might perhaps be developed and enhanced by suitable designing. The auto-transformer acts in some degree as a buffer, reducing sudden stresses in the motor and minimising the effect on the supply system; it is therefore preferable for the larger sizes of squirrel-cage motors.

A more obvious advantage of this type of starter is that the tapping can be selected to suit any particular starting requirements. It is advisable to use a tapping as low as possible—one that will ensure positive starting of the motor, but still leave something to be accomplished on the "load" position. As in the case of the single-phase motor, there is no valid objection to the motor being thrown on to the line before it attains its full-load speed, provided the second "kick" of the current does not exceed that on first switching-on—or is even a little less. The obvious advantage of such a procedure is that the maximum current taken during starting is reduced.

Motors of the slip-ring type, being started by rotor-resistance starters, have practically ideal starting conditions. The stator in these is controlled by a circuit breaker—preferably oil-immersed—interlocked with the rotor starter, and fitted with no-volt and overload trip coils.

The function of the overload trip coils is twofold. They should, by tripping out the starter and stopping the motor, protect the driven machinery from further damage in the event of an overload caused by any trouble in such machinery. Considered from this point of view, one overload coil should be sufficient for a three-phase equipment. The motor, however, requires protection from the effects of any breakdown in the windings, and against the stresses set up in the event of an "earth" occurring in one of the phases. The use of overload trip coils in two of the phases would afford ample protection against the former con-

*"Single-phase Induction Motors and the Starting Problem," by F. W. D., ELEC. REV., January 4th, 1924.

tingency; but (in cases where the neutral is earthed) two overload trips do not safeguard the motor in the remote but not impossible contingency of an "earth" occurring in the unprotected phase of the winding. It may be argued that the modern motor is so robust and reliable that it does not need such protection; but if this view is taken, there is no reason why even two overload releases should be provided: one should suffice. Logically, either one or three release coils should be employed, according to the extent of the protection desired.

**Direct-current Starters.**

With direct-current motors the conditions are quite different. For one thing, the short-circuit current is practically unlimited; it is therefore out of the question to switch such motors direct on the line (excepting quite small series-wound motors of high resistance, such as are used for the smaller domestic appliances, dentists' instruments, &c.).

The face-plate type of starter is usually employed. This should be fitted with a no-volt release, though there is less to be said for the use of an automatic overload device—at any rate on motors up to about 25 b.h.p. A pair of fuses embodied in the ironclad switch panel afford sufficient protection against overloads, whilst the longer time lag obtained with fuses is an advantage from the point of view of the consumer, who does not like his machinery to be stopped by every momentary overload that may occur. Provided the fuses are accurately calibrated, there seems no reason why the use of the flimsy and none too accurate overload devices usually associated with direct-current starters should be encouraged.

Further safeguards are required for the larger motors, which need to be protected against being started too hurriedly: they must be "fool-proof," to use the significant though rather uncomplimentary expression common amongst electrical engineers. This desirable consummation can be attained by the use of the multiple-lever starter. In this the fitting of a reliable and fairly accurate overload trip coil, operating through a contactor main switch, does not add materially to the cost. Moreover, the starting gear may be simplified by the incorporation of a double-pole overload circuit-breaker in the multiple-lever starter, thus obviating the need for a main switch and fuses.

Motor-starting panels embodying refinements not dealt with in this article have many obvious and useful applications—even for quite small motors; but for the more usual and normal cases simplicity of the starting gear is a desideratum which is worth some sacrifice. It is always necessary to consider carefully the particular requirements of every motor drive, the class of labour that will be employed to operate the motor, and the limitations of the supply system on which it is to be installed; but subject to these provisions, we may summarise our conclusions thus:—

| Output of motor (assuming standard speeds). | Starting gear. Alternating current. | | |
|---|---|---|---|
| | Single-phase. | Two-phase. | Three-phase. |
| Up to and including 3 b.h.p. | D.P. switch and fuses, with non-automatic starter. (Squirrel-cage motor.) | T.P. switch and fuses. (Squirrel-cage motor.) | T.P. switch and fuses. (Squirrel-cage motor.) |
| From 3 b.h.p. to 25 b.h.p. | D.P. switch and fuses, and drum type phase-splitting starter with o.l. release only. (Squirrel-cage motor.) | Drum type series-parallel starter with n.v. and two o.l. trips. (Squirrel-cage motor.) | Drum type star-mesh starter with n.v. and three o.l. trips. (Squirrel-cage motor.) |
| From 25 b.h.p. to 50 b.h.p. | D.P. circuit-breaker with n.v. and o.l. release, and rotor-resistance starter. (Slip-ring motor.) | Drum type auto-transformer starter with n.v. and two o.l. trips. (Squirrel-cage motor.) | Drum type auto-transformer starter with n.v. and three o.l. trips. (Squirrel-cage motor.) |
| Over 50 b.h.p. | — | Oil-immersed circuit-breaker with n.v. and two o.l. trips, interlocked with rotor-resistance starter. (Slip-ring motor.) | Oil-immersed circuit-breaker with n.v. and three o.l. trips, interlocked with rotor-resistance starter. (Slip-ring motor.) |
| | Direct current. | | |
| Up to and including 25 b.h.p. | D.P. switch and fuses, and face-plate starter with no-volt release. | | |
| From 25 b.h.p. upwards. | Multiple-lever starter, incorporating no-volt and d.p. overload circuit-breaker. | | |

# A New E.D.A. Scheme.

It is a tendency of the electrical industry to take too much for granted so far as the general public is concerned. Men in the various branches are so imbued with the "electrical idea" that they cannot conceive that the backwardness of the people is anything more than sheer apathy. They think that if electricity cannot sell itself on its merits alone there is nothing more to be done. Accordingly they go on advertising their individual products merely hoping to attract the attention of those who are already converted to electrical methods, while suppliers of electricity wait for the would-be consumer to call at the office for a list of charges. There are many honourable exceptions, but they must be exceptions, or Great Britain would be using as much electricity per head as, say, the United States.

Electricity will not sell itself any more than other commodities which are not positively essential. It is futile to say that electricity *is* essential to the *individual*, however fundamental the part which it plays in modern civilisation. That electricity will ultimately supersede every other form of energy we are convinced, and we therefore conceive it to be the duty of all who desire the advancement of the race to hasten that consummation. Electricity will then be really essential, for its competitors will have fallen out of use.

As electricity will not sell itself and humanitarians are not yet thoroughly electrical, there is only one way of bringing about the desired end, and that is education. The public is not apathetic when it is shown where its best interests lie and it is the work of the electrical industry to do this. Individual advertisement has accomplished a great deal, and so have co-operative efforts by sections of the industry. The co-operation of all sections in the Electrical Development Association will do more, for the first move must be the inculcation of the "electrical idea" rather than the selling of any particular appliance. Within the rigid limits imposed by inadequate funds, E.D.A. has accomplished a great deal, but none of its very effective slogans is yet a household word.

The Association, while thankful for past favours, candidly says that the industry is not giving it enough money to make its work as effective as it should be. It is compelled to make more or less spasmodic efforts instead of carrying on a sustained campaign. It is necessary for all branches of the industry to realise that the Association is not a charitable concern; contributions given to it are very definitely an investment with great potentialities. This will be fully realised by those who read a brochure which has recently been addressed by the Association to the members of committees, boards, and managers of all electricity supply undertakings in Great Britain. In this publication the policy of the Association and indications of the wide scope for

electrical development are fully set forth, and it is shown how small a proportion of the revenue of electricity supply undertakings is devoted to the important work of development, *i.e.*, educational propaganda. The responsible persons addressed are requested to arrange that one-tenth of one per cent. of the revenue of their undertakings shall be contributed to the funds of the Association, and it is stated that the manufacturers' and other associations have agreed to increase their subscriptions if the suppliers respond to the appeal.

It is confidently anticipated that the proposals for future activities will result in assuring for the Association a revenue sufficient for its growing internal work, and in addition for direct educational efforts to the value of from £20,000 to £25,000 per annum. The main objectives of the campaign which, by this means, the Association will be able to carry out will be:—To build up national and industrial goodwill; to remove unwarranted bias and criticism; to establish and maintain public confidence; to encourage local inquiries for electrical information and advice; to create demand; to obtain increased revenue from the fixed charges of electricity supply undertakings; to reduce the cost of supply to consumers; and to increase the revenue and profits of suppliers. Nothing is said of the direct benefits to manufacturers and contractors, but these are, of course, sufficiently obvious.

Such a programme should loosen the purse strings of the most sceptical or conservative committee or board.

# Legal.

### Price v. Fleury.

In the Bow County Court, on May 12th, before Judge Snagge, Thomas W. Price, of 103, Hibbert Road, Leyton, sued Edward Fleury, in connection with a partnership, in which they traded as Fleury & Price, electrical and mechanical engineers and contractors, at Walthamstow. In the statement of claim, it was set out that the partnership commenced in January, 1923, the terms of the partnership being that they should share the capital, the profits and the losses. In October, 1924, this partnership was determined, and at that time there was a very large stock of electrical goods and machinery at the business premises. It was alleged that since the partnership had ceased, the defendant had collected a number of the accounts of the late partnership, and had also been round to the customers of the late firm, soliciting orders, suggesting that he was now the firm. Money had been owing by the firm to various people in connection with the business, but whenever this was applied for, it was alleged that the defendant had said he had nothing now to do with the business, it was the plaintiff who should be sued, in consequence of which, actions had been brought against the plaintiff. Further, it was suggested that defendant had detained a number of books and documents which were the property of the firm. The plaintiff now asked that the defendant should be restrained from carrying on as he had been doing that an account should be taken of any assets of the business, and of any business that had been done since, and it was further asked that an injunction should be granted against the defendant. When the case was called on it was announced that the parties had practically agreed as to what should take place, and after a conference, it was decided that a receiver of the business should be appointed, no injunction should be pressed for, and the costs reserved.

### Bilantz v. Hunt's Surplus Stores.

At the Marylebone County Court on May 11th, before Judge Scully, the plaintiff, an electrician, sued the defendants, of Harlesden and Edgware Road, for £45 14s. 2d., on account of an electrical installation carried out at the defendants' Edgware Road premises. It was stated that the son-in-law of the owner of Hunt's Surplus Stores gave the order for the installation, and it was contended by the defendants that this was nothing to do with their business, being put into quarters above the shop in which the owner's son-in-law resided.

His Honour gave judgment for the defendants.

### Ingersoll Watch Co., Ltd., v. Ingersoll Wireless Co., Ltd.

In the Chancery Division on May 15th, before Mr. Justice P. O. Lawrence, the plaintiffs moved for an injunction restraining the defendants from carrying on the business of manufacturers of or dealers in radio apparatus under the name adopted by them, and from using in any manner the name "Ingersoll" so as to lead to the belief that the defendants' business was connected in any way with that of the plaintiffs.

Sir Duncan Kerly, K.C., for the applicants, said that his clients' business was that of watch-making: it was perhaps the biggest watch company in the world. For a time, in 1923, the company had taken up the radio apparatus business, but in September of that year it was dropped.

The defendant company undertook not to use the script which had been used, and his Lordship said that no order would be made on the motion, except that the costs would be costs in the trial of the action on the defendant company's undertaking not to use the script. A speedy trial is being arranged.

### Harland Engineering Co., Ltd., v. Swansea Corporation.

In the Court of Appeal, before Lords Justices Bankes, Scrutton and Atkin, on May 11th, the Harland Engineering Co., Ltd., Greengate, Manchester, appealed from a judgment of Mr. Justice Talbot at the Cardiff Assizes in favour of the Swansea Corporation. The plaintiffs brought the action to recover the sum of £900 for electrical work done by them in connection with a housing scheme carried out by the Corporation in 1923. The Corporation denied liability, alleging that the appellants had to look to the head contractors, who had gone into liquidation and who had assigned all moneys due to them to their debenture-holders. Mr. Justice Talbot decided that the appellants had no right of action against the Corporation and the Lords Justices now affirmed Mr. Justice Talbot's decision and dismissed the appeal with costs.

### The Insurance of Generating Plant.

The Keighley Corporation Electricity Committee announces the result of arbitration proceedings in which an important point of interest to all electrical undertakings was decided by Mr. A. M. Langdon, K.C., in a case between the Corporation of Keighley and the Vulcan Boiler and General Insurance Company, concerning the renewal of insurance premiums upon a 5,000-kW set at the Keighley electricity works, to which an accident happened during the period of grace allowed for the renewal of the policies. The set was insured for £2,000 with the company and the customary renewal notice was sent by the company, together with the intimation of a period of grace of fourteen days after the expiration of the order. During the period of grace an accident occurred and the company repudiated liability. The arbitrator decided that the company was not liable to pay the Corporation any damage or loss under the policies, and that the Corporation should pay the costs of the action.

# Correspondence.

***Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.***

### The Power Required for Pulverising Coal.

My main object in addressing you on the above subject is to correct an impression which Mr. Parsons's article in your issue of May 1st is certain to create, *i.e.*, that the power absorbed in pulverising has an important influence on the economic value of the powdered-fuel boiler.

It is impossible to approach the subject in the manner adopted by Mr. Parsons, and a true estimate of the relative merits of pulverised fuel firing can only be reached by considering the matter from a much broader point of view. In comparing pulverised fuel firing and stoker firing the obvious method is to arrive at the relative cost of steam production in the two cases and this must include charges on capital outlay, labour, power, maintenance, and fuel costs. I have recently had an opportunity of studying the subject in considerable detail, and have arrived at the following conclusions based on the average of several power plants on which complete estimates were prepared both for pulverised fuel and stoker firing equipment.

*Capital Charges.*—The capital cost of pulverised-fuel plant as applied to a given boiler is necessarily higher than that of stoker equipment, as it includes drying and pulverising units, coal feeders, burners, &c. Off-setting high initial cost, however, the evaporation per square foot of total heating surface is very considerably greater than is the case with stoker equipment, due to the use of radiant heat-absorbing surface in the form of water screen and water-cooled side walls. For the same capacity, the boiler heating surface in an average case is approximately 30 per cent. greater with stoker firing than with pulverised-coal firing. With this difference in heating surface, the capital outlay with pulverised fuel is approximately 10 per cent. higher than with stoker firing. This covers the complete plant equipment, boilers, economisers, mechanical draught, &c., including erection.

*Operating Costs.*—Labour, power, and maintenance.

A great deal of information is now available regarding operating costs with pulverised fuel, and from this it is well established that in an average case *labour charges* on a coal tonnage basis are approximately 20 per cent. lower than with stoker firing, due to the greater ease of control, absence of clinker in the furnace, and lessened ash trouble, while general *maintenance charges* per ton of coal are 30 per cent. lower on account of greatly reduced furnace maintenance. *Power charges* on a coal-tonnage basis are admittedly about three times higher than with stoker equipment, but this increase is almost exactly balanced by the saving on labour and maintenance. *The total operating cost* per unit of steam produced in plants of the same capacity is therefore about 7 per cent. lower with pulverised-fuel equipment than with stoker equipment—the difference in the thermal efficiency in the two cases.

*Fuel Costs.*—By far the most important factor influencing the comparison, and one which has been entirely overlooked by Mr. Parsons, is the cost of fuel, which constitutes between

60 per cent. and 70 per cent. of the total cost of steam production, including all fixed and operating charges.

With stoker equipment the choice of fuel is limited with regard to size, caking characteristics, calorific value, volatile ash and moisture content, whereas with pulverised-fuel plant the number of B.th.u. per penny of cost is practically the only criterion, with certain broad reservations regarding volatile content. It will thus be realised that pulverised-fuel equipment greatly widens the field of choice open to the fuel purchaser, and from this point of view alone pulverised fuel offers immense possibilities in the way of steam cost reduction. Coal suitable for use in pulverised form may be obtained in bulk at prices varying from 8s. to 16s. per ton delivered, depending upon the location of the plant. A reduction in the annual fuel bill amounting to 50 per cent. is therefore possible in many cases. The wider field of fuel purchase also enables the user of pulverised-fuel plant to follow the market closely and to take advantage of fluctuations in price.

*Total Cost of Steam Production.*—Taking into account fixed charges, including interest on capital, depreciation, insurance, and taxes, operating costs, including labour, power, maintenance, and fuel costs, pulverised-fuel plant shows a definite net saving per unit of steam produced when burning the same fuel as a stoker plant of the same steam capacity. With the cheaper fuels available for use in pulverised form, the total cost per unit of steam produced may be reduced by 15 per cent. to 25 per cent. or more, depending upon the location of the plant.

Apart from the greater efficiency and the many operating advantages of the pulverised-fuel boiler, the increased capital outlay, as compared with stoker equipment, is therefore a first-class investment, which in the majority of cases shows a return in excess of 100 per cent. per annum. In one plant very favourably situated with regard to the coal fields the estimated net annual saving as compared with stoker-fired boilers corresponded to nearly 300 per cent. interest per annum on the increased capital expenditure.

The above figures are based on an evaporation of approximately 800 million lb. of steam per annum. In the case of an installation of smaller capacity the comparison will, of course, be less favourable to pulverised fuel, and conversely, will be more favourable in the case of a larger installation.

In the above I have endeavoured to state the case as briefly as possible, as a complete analysis would occupy too much of your valuable space. It is hoped, however, that the remarks made will dispel the impression created in Mr. Parsons's article that the economic possibilities of the pulverised-fuel boiler in any way hinge on the power absorbed in the mills.

Mr. Parsons has plotted test results published by Mr. Kreisinger, and deduces an expression purporting to give a general relationship between the power absorbed in the mills and the weight of coal pulverised per hour. The power absorbed in pulverising varies so widely with the structure of the fuel and with the percentage of volatile matter, ash, and moisture, that such a relationship based only on three different types of fuel would not appear to be of much practical utility.

**E. G. Ritchie, D.Sc.**

London, *May 11th*, 1925.

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### Fires Caused by the Charging of Accumulators.

I would draw attention through your columns to the comparatively large number of fires which have occurred recently during the process of charging accumulators such as are used largely at the present time for wireless work.

Scarcely a day passes without the occurrence of a fire or fires occasioned by this cause, due to the fact that the containers of the cells in the majority of instances are made of celluloid, which, as is well known, is a highly inflammable substance, and in the case of a recent fire at Birkenhead the loss of the life of at least one person resulted.

The question arises whether it is within the bounds of possibility for the electrical trade to devise some non-inflammable form of container, so that the present heavy risk of fire may be minimised.

**Surveyor.**

*May 11th*, 1925.

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### National Electric Power.

Mr. R. C. Andersen, in his three articles on the above subject, throws considerable light upon this much vexed and urgent problem, and for this we should feel greatly indebted to him; but, in my opinion, his policy as to control would completely fail of accomplishing the object he has in view, *i.e.*, that of cheapening and extending the use of electricity and at the same time avoiding the Socialisation of the industry. To my mind, both as an engineer and as a public representative, the first thing needed is to secure a stable and far-sighted policy as to ownership and control, and until we get this the business of generating and supplying electricity in this country will remain in a backward condition as compared with other countries.

Mr. Andersen's policy appears to be to cast aside every form of public control excepting that of the Commissioners. He roundly condemns the idea of a Joint Electricity Authority, as he fears this may lead direct to the Socialisation of the industry. Following this, as one would naturally expect, Mr. Andersen goes all out for "Private Enterprise," not only for the big generating stations but, as far as can be gathered from the somewhat involved arguments presented in column 2 of article 3, for distribution as well. He gives the present municipal undertakers but a competitive status, and even that is to be subject to the Commissioners.

It is common ground that a large measure of "Standardisation" is essential, also that many of the small electrical concerns, both municipal and company owned, should disappear. The company concerns present little difficulty beyond finance, but the municipalities present a far different problem. As a whole these will never acquiesce in the surrender of their electricity supply undertakings and the admission of private-enterprise supplies. Thus, if the Commissioners, or Parliament, forced such an issue the result would be endless friction, agitation, and instability; ultimately, as the inevitable swing of the political pendulum brought in a fresh Government, we should be faced with a change of policy involving wholesale nationalisation of the industry—a veritable catastrophe. Even now it is becoming apparent that the so-called London settlement will not survive a change of Government. It may be alleged that the only control needed is that of the National Electricity Commissioners. That may be so, but one has to bear in mind that this body has little or no weight, it has no prestige, one may even go so far as to say that there is no general trust in its decisions. It is also well to bear in mind the furious litigation that sprang up in certain very Conservative municipalities at the mere mention of private-enterprise concerns being permitted to enter into their boroughs.

National "Bus Bars" are probably not the most practical way of dealing with the extension of electrical supply, but there can be no doubt that if the municipalities are to be induced to willingly come into any scheme of "large area" generation and distribution—desirable as this is—then Joint Electricity Authorities, or something similar, will have to be set up. There is no room for party politics or prejudices of any kind, but it is self-evident that the day of "public utilities" such as electricity, being owned and managed, uncontrolled, by private enterprise has passed and that there can be no finality, or stability, in continuing or attempting to extend it.

**William B. Pinching.**

London, *May 15th*, 1925.

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In his letter dated the 11th inst., Mr. Geo. V. Twiss disagrees with my contention that were his proposals for the creation of a National Electricity Board adopted, the latter would constitute a single market for generating authorities.

He says that because his proposal will allow efficient authorities to continue their generation and supply indefinitely, the single-market thesis is untenable.

Were parochial or pin-point generation and supply maintained as it is at present, this might be so. The creation of a National Electricity Board, however, predicates nation-wide supply and the development of extensive loads in all areas.

According to Mr. Twiss's own showing, a vast increase in the present consumption of electrical energy may be expected; and this will necessitate the installation of a very considerable amount of new plant. To my mind the major output of such will be absorbed by the Board for relatively distant loads. In other words, a generating authority will be faced by a single purchaser demanding much the greater portion of its supplies.

When it is considered (to quote Mr. Twiss) that "*generating stations should only be allowed to continue, or new ones to be built, provided their owners are prepared to give bulk supply at equitable rates to the Electricity Board when called upon to do so*," the gravity of the strangle-hold on generating authorities that would ensue becomes all too clear.

Whichever way one turns one comes back to the single market for electrical energy which would result if the National Electricity Board became a reality.

**R. C. Andersen.**

London, *May 18th*, 1925.

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### The Fire at an Electric Farm.

Thank you very much for the publicity you gave to my appeal for catalogues, &c., after my disastrous fire. Judging by the results of this, the power of the Press is indeed great, and I am very much indebted to all who have come to my assistance.

My new office is now in course of erection, and the ashes of my old library are fertilising the soil (an effective, if expensive, manure).

**R. Borlase Matthews.**

East Grinstead, *May 13th*, 1925.

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### Installation Accessories.

I notice that your correspondent, Mr. J. W. Meares, states that in two years he has had to attend to no fewer than 35 "burns out" of flexible cord.

My firm recognised some years ago that the ordinary flexible cord is quite unsuitable for electric irons and portable electric appliances, where there is considerable strain and handling. For this reason we introduced our "Feraflex" cord, which has steel core wires stranded with the copper wire, in order to relieve the strain, and there is a braiding of real asbestos fine yarn to reduce the risks of fire to a minimum.

To obviate kinking, the cord has a strong glazed cotton braid over the twist, with the result that the "Feraflex"

overcomes, to a very great extent, the inconvenience and fire risks of the usual cord attached to portable appliances.

Many of the leading manufacturers in America and Canada have recognised the necessity for the use of such a cord as "Feraflex."

**M. H. Goldstone.**
*(Ward & Goldstone, Ltd.)*

Manchester, *May 15th*, 1925.

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### "Protective" Metal Casing Risks.

Again I must draw attention to the risks attendant upon the use of metal coverings for safety fuse gear, aggravated by the fact that "earthing" of all such metal coverings is compulsory.

On this occasion the fuse boxes and interiors were of a well-known manufacture with porcelain carriers of special design where the length of fuse wire channel was appreciably longer than the actual straight-line measurement between terminals, the porcelain carriers being in close proximity to the metal cover.

A fault developed on the installation, with the result that the "safety" distributing fuse created an arc between its terminals and the metal cover (earth).

The main fuse operated in a similar disastrous manner.

Fortunately the resultant fire was arrested in its incipient stage, otherwise there might have been another detrimental lay-Press report of a fire in a public place of entertainment, believed to be due to electrical causes.

Designers should recognise the fact that metal work is inflammable where electricity is concerned, and great care should be exercised in adequately spacing or insulating casing with suitable indestructible lining from adjacent possible sources of arcing in fuse and switchgear equipment.

Also, adequate means should be provided for the extinguishing of an arc in its incipient stage, and the actual straight-line measurement between terminals and between the latter and the metal covering should not be lessened on the score of reducing the cost of materials. Safety and immunity from fire risk should be the first considerations.

There is still much to be said in favour of the good, though it may be said to be old-fashioned, hard-wood cover, suitably ventilated and amply proportioned with long-break cartridge fuses, together with a wiring system in which there is an agreeable absence of metal encasements with all their troublesome "earth" bonding gadgets—several of questionable efficiency in permanency of good current-carrying capacity.

I mention long-break fuses in view of the foolhardy temporary expedients that have been, and apparently will always be, adopted in emergency when proper replacement carriers are not readily available.

Special care is the more necessary in view of the extended use of turbo-generators in supply stations which maintain the pressure against obstacles in a manner unheard-of in the days of the reciprocating-engine generators.

**J. C. Elvy,**
*Consulting Engineer.*

London, *May 13th*, 1925.

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### The History of the Telephone in the United Kingdom.

The letter from Mr. E. H. Bennett, of the States Telephone Department, Guernsey, which appears in your issue of May 15th, contains statements relative to the information contained in the above-mentioned book of such an exaggerated and even damaging character, and which are quite uncalled for, that I find it necessary to solicit your kind indulgence in giving space in your columns to this communication in refutation of Mr. Bennett's allegations.

I am utterly at a loss to understand the reason for Mr. Bennett's misrepresentation of the figures quoted relative to the Guernsey States Telephone System. The information to which Mr. Bennett refers in Table 12 was extracted from a copy of the "Balance Sheet, Revenue Statement, and Statistics," issued by the Guernsey States Telephone Department, kindly supplied for the purpose by Mr. E. H. Bennett by permission of Mr. A. R. Bennett, the consulting engineer, but Table 12 does not claim to be a complete copy of that statement.

I have carefully checked the figures in Table 12 of my book to which Mr. Bennett refers with those of the statements furnished by him, and I find them in absolute agreement.

In this table no reference whatever appears as to the number of inhabitants per telephones as implied by Mr. Bennett's letter, but figures supplied by him in a letter dated March 27th, 1922, are quoted on page 384 of my book, and these also, on examination, prove to be correct.

I am quite aware that in a work of such dimensions as "The History of the Telephone in the United Kingdom," in spite of my best endeavours to avoid mistakes, some errors may have occurred, and I shall be grateful to any who call my attention to inaccuracies which they may observe. Mr. Bennett has, however, drawn attention to no error whatever. His accusation that I have altered the figures he supplied and have presented erroneous information is entirely without foundation, and his criticism is, therefore, neither helpful nor seemly.

**F. G. C. Baldwin.**

Wylam-on-Tyne, *May 16th*, 1925.

### Maxtorq Motors.

I was very much interested in the correspondence on the above subject and noted Mr. A. P. Wood's suggestion that no other squirrel-cage motor on the market would take full stalling current for five minutes without injury.

I have made a test on one of a batch of five special high-torque motors which have just passed through our works, with the result that this motor remained stalled on full voltage for five minutes *without* the rotor getting red hot, and afterwards continued to perform its normal test. The above test was made at our customer's works.

The voltage of the machine was 220 volts, 3-phase, the short-circuit current per phase being 235 amperes, the power factor at standstill about 0.65, and the equivalent resistance of the rotor winding about 4½ times that of the stator winding.

We have been making such machines for over 10 years for many duties, and in 1916 we manufactured a high-torque squirrel-cage motor, to comply with the following specification:—50 h.p., 50 cycles. Full-load power factor, 86 per cent. Full-load efficiency, 88 per cent. Full-load torque on star coupling to be obtained with a current not exceeding 1.7 times the full-load value.

The above motors are sometimes put to duties which require starting up on full load once every three minutes, and they have been manufactured to take a standstill h.p. up to 200.

With reference to the high starting torques and inching duties of 3-phase motors, a complete theory of these machines is given in Steinmetz's "Theory and Calculations of Electrical Apparatus," pages 1-92, and the theory of a positive temperature coefficient starting device is given on page 2, which, in conjunction with the proper torque characteristic, is quite suitable for effective inching.

**James C. Macfarlane, O.B.E., Wh. Sch.**
*(Managing Director,*
MACFARLANE ENGINEERING CO., LTD.)

Glasgow, *May 15th*, 1925.

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We should like to extend a cordial invitation, not only to Mr. Hoseason, but to everyone interested, to visit our works and see Maxtorq motors in operation.

Maxtorq motors speak for themselves better than we can speak for them, and their real testimonial is the increasing number that are being used on jobs which were previously driven by slip-ring motors. We have supplied large numbers of these motors for live-roll gears in steel works, which are giving the greatest satisfaction. We are also supplying a number of Maxtorq motors to replace slip-ring motors on steelworks cranes.

We are now, fortunately, in the position of being able to tell people that they need not worry what we say or what our competitors say, but that their best plan is to get an unbiased opinion from an actual user.

Before this correspondence closes, we must admit that we are still quite unrepentant at having supplied large numbers of people with motors at once simpler and more reliable than their previous slip-ring motors.

**The Lancashire Dynamo & Motor Co., Ltd.**
(A. P. WOOD, *Managing Director.*)

[This correspondence is now closed.—EDS. ELEC. REV.]

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### Aeroplane Crashes and Ignition Circuits.

Having had a considerable experience in magneto repairing, it seems to me that Mr. H. C. Booth is rather out of date.

In the first place, practically all modern magnetos are connected in the way which he maintains is incorrect. I have occasionally come across one connected otherwise, but they are rare. Then with regard to condensers all the best modern magnetos are fitted with mica condensers, not paper ones, as he seems to think. Personally, I have found the condensers as reliable as the other parts, but most people seem to regard them as delicate, and perhaps rather mysterious; consequently much is attributed to the condenser, of which it is entirely innocent. I have myself seen many condensers scrapped which were really quite good. It seems to be the regular thing if a repairer is puzzled to get out of it by saying: "Oh, it's the condenser."

The primary winding will occasionally burn out, but this is very infrequent, though trouble often occurs at the joint between primary and secondary, showing that the voltage at this point is higher than most people imagine.

Some time ago I had considerable trouble with the windings turning green, as stated by one of your correspondents. On this occasion I traced it to the varnish. I found that if the varnish were thinned down with the thinnings supplied by the makers, the wire would turn green unless baked till perfectly dry inside as well as outside. Many failures are caused by the secondary winding, which, being of very fine wire, is easily damaged. A kink in the wire when wound on may not be noticed, but may cause a break after the armature is wound. Provided that the voltage is high enough at the break, the spark will pass across and the magneto may appear to be in perfect order until, after a time, the continued sparking inside will burn a hole in the winding.

I have also found cases where shorts have occurred between layers, and the magneto has continued to work, but has become

very weak, as though only half the winding were in circuit. Much trouble is caused by the contact breakers, but my experience has been that the magneto is quite as reliable as the engine to which it is fitted.

*May 16th*, 1925. **Mag. Repairer.**

### A City Guilds Examination Question.

With reference to the above query in your issue of the 15th inst., the difference between the calculated and the measured insulation resistance is due to the poor insulating qualities of the panels in the distributing fuseboard. As these panels are bushed with ebonite, or similar material, for the fixing screws, the insulation resistance to earth is not impaired, but the effect is to cause all the circuits to give approximately the same readings, so that if one circuit is low all the others are affected.

This is quite a usual condition to find when localising faults on large installations where slate is used for the panels in distribution boxes, sub-main fuseboards, &c.

The only way to obtain correct readings and so comply with the third part of the question is to disconnect each circuit from contact with the distribution fuseboard and test it separately. This method will also eliminate the possible effect of leakage currents, though I do not think that this is the essence of the question.

**H. H. Atkinson.**

Epsom, *May 16th*, 1925.

# Business Notes.

**The Prime Minister and the Engineering Industry.**—On May 12th, Mr. Stanley Baldwin, accompanied by Sir A. Steel-Maitland, Minister of Labour, and Col. Wilfrid Ashley, Minister of Transport, received a deputation from the Amalgamated Engineering Union, headed by the chairman, Mr. J. T. Brownlie. The object of the deputation was to lay before the Prime Minister the following resolution:—"In view of the fact that the Amalgamated Engineering Union has during this period of industrial depression paid over £4,000,000 in benefits to its members; and also that thousands of skilled mechanics have recently migrated to the United States, thus constituting a serious loss to the nation, this National Committee is strongly of the opinion that the Government should put in hand immediately engineering projects, and assist in developing such projects of public utility and importance, thereby finding employment for skilled mechanics."

Mr. Brownlie amplified this resolution by outlining the causes which gave rise to it. With regard to the carrying out of large engineering projects to provide employment, he made particular reference to the electrification of British railways and the improvement of trading facilities with Russia.

Mr. Baldwin, in a sympathetic manner, dealt with the points raised, and promised that the Government would lose no opportunity of encouraging any practical plan that seemed likely to provide employment. Col. Ashley said that considerable progress had been made with the preparation of a scheme of national electrical development.

**The British Engineers' Association.**—The thirteenth annual general meeting of this Association was held at the Hotel Victoria, London, W.C.2, on the 14th inst., when the work of the Association during the year was reviewed and the report of the Council and the annual accounts were presented. Mr. H. J. Ward, of Messrs. J. & E. Hall, Ltd., Dartford (see our "Personal" column to-day), was unanimously elected president in place of Sir Ernest W. Petter, who retired after holding office for two years. Messrs. Harry Allcock, Col. P. B. Crowe, F. H. Livens, and Engineer-Vice-Admiral Sir George Goodwin, K.C.B., LL.D., were elected vice-presidents, and the following were elected members of the Council:—Messrs. W. G. Ardley, H. M. Butler, R. A. Blakeborough, Chas. H. Booth, C. E. Douglas, F. C. Fairholme, David Lycett Green, Arnold Gamble Sir James Kemnal, J. F. Parker, Philip D. Priestman, Gerald F. Prest, R. S. Rowell, Sir John Thornycroft, K.B.E., and Gilbert C. Vyle.

**Trade Announcements.**—THE BRITISH HOME & OFFICE TELEPHONE CO. has removed to 161-166, Strand, London, W.C.2.

MESSRS. J. HOPKINSON & CO., LTD., Huddersfield, have reopened their Blackpool showroom for the 1925 season. A full range of safety boiler mountings, high-pressure steam valves, &c., is exhibited.

MESSRS. L. A. GAMBLEN & PARTNERS have taken over the agency of the Airedale Electrical and Manufacturing Co., Ltd., Bowling Old Lane, Bradford, for Yorkshire, Nottinghamshire, Lincolnshire, and Leicestershire.

MESSRS. LEONARD TOOMER & CO., of 54, Lower Thames Street, London, E.C.3, have acquired the goodwill of Messrs. Weller & Gibson, Ltd. (in liquidation), electrical and radio suppliers, of 31, King Street, Tower Hill. All correspondence relating to the business, also trade price lists, should be sent to Lower Thames Street. (Telephone: "Royal 2770.")

Owing to the growth of their business, ELECTRICAL INSTALLATIONS LTD., have formed a separate company, styled ELECTRICITY SERVICES, LTD. (the registration of which is recorded in our "New Companies" section to-day), at 27, Martin Lane, Cannon Street, E.C.4, to deal with that side of the business not concerned with heavy engineering. Mr. H. F. Simons, joint managing director for the past 19 years, will personally manage the new company.

**Bankruptcy Proceedings.**—W. A. HUNTLEY, 62, Albion Street, Leeds, late of Bradford, X-ray engineer.—The receiving order herein was made on April 30th on debtor's own petition. The statement of affairs showed liabilities of £1,213, and the assets are all absorbed by preferential claims. Debtor attributes his failure to lack of working capital, keen competition in the radio business, heavy travelling and general expenses, and bad trading. Debtor commenced business on his own account in March, 1921. He had no capital of his own, being financed by friends. The liabilities and assets of the business were, he says, taken over by a limited company in May, 1921, and he was employed by the company as northern branch manager until the company went into liquidation in February, 1924. From March to September he was in business in Church Street, Buttershaw, and from March, 1924, to February, 1925, he was also trading at Manchester Road, Bankfoot, Bradford. Since March of the present year he has traded at Leeds. He admits that he first became aware of his position in January, 1925, and that he gave a bill of sale in June, 1924, for £150 over certain furniture now in store at Halifax.

A. THOMPSON (Arnold Electrical Co.), electrical and mechanical engineer, 38, Lucy Street, Hulme, Manchester.—Receiving order made May 8th on debtor's own petition.

J. ADDY, wireless and cycle dealer, Bridge End, Long Preston, Yorks.—First meeting, May 19th at Official Receiver's offices, 12, Duke Street, Bradford. Public examination, June 8th at the County Court, Bradford.

J. E. LOCKING, dealer in wireless goods, &c., 14, Fish Street, Kingston-on-Hull.—First meeting, May 20th at the Official Receiver's office, 37, Scale Lane, Hull. Public examination, June 29th at the Guildhall, Hull.

T. G. H. WILEY (Wiley & Co.), electrical engineer, late of Cemetery Road, Pudsey, and Oxford Place, Stanningley, now at Bradford Road, Stanningley.—Trustee, Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford, released May 7th.

G. R. TOPLISS, electrical engineer, 9, Palatine Chambers, Halifax.—Trustee, Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford, released May 7th.

E. DOWNING (lately in co-partnership with E. J. Mills as manufacturers of electrical conduit fittings and general electricians), Osborne House, Regent Street, Willenhall.—Last day for proofs for dividend, May 29th. Trustee, Mr. S. W. Page, Official Receiver's office, 30, Lichfield Street, Wolverhampton.

W. T. ELLIS AND C. A. HORNSBY (Ellis & Hornsby), electrical engineers, Gwynfryn, Deganwy Avenue, Llandudno.—First and final dividend of 3s. 7½d. in the £, payable May 29th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

**Company Liquidations.**—LEES BROTHERS (HOVE), LTD., radio apparatus manufacturers and motor engineers, 10, Westbourne Place, Hove.—A meeting of the creditors of the above was held on May 8th at the offices of Messrs. Orbell & Kirk, Brighton, when a statement of affairs was presented by Mr. A. E. Orbell, the liquidator, which showed liabilities of £1,781, of which £560 was due to trade creditors and the balance to cash creditors. In addition, there were debentures and interest amounting to £375. The assets were estimated to realise £438, which was only sufficient to meet the claims of the debenture holders and preferential claims amounting to £63. It was reported that the company was formed in October, 1920, with a nominal capital of £1,500, to purchase the business of a motor engineer for £825. Since August, 1922, the directors had devoted their attention to the manufacture of radio apparatus, the motor repair business having been entirely abandoned. The debentures were issued in August, 1921, in return for cash advanced by relatives of the directors. The liquidator said that the company had never traded at a profit.

The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Butcher, C. F. ... ... ... | 22 | Marconi Co., Ltd. ... ... ... | 76 |
| Auto Sundries, Ltd. ... ... | 31 | Freeman, L. J. ... ... ... | 45 |
| Fox, C. H. ... ... ... ... | 96 | Galliers (Wholesale), Ltd. ... | 37 |

RADIO PRODUCTIONS (LEEDS), LTD., 107, Portland Crescent, Leeds.—A meeting of the creditors of the above was held recently, when Mr. C. H. Baker, the liquidator of the company, presented a statement of affairs which disclosed liabilities of £5,718, of which £4,776 was due to the trade, and £900 to cash creditors, while there were other liabilities amounting to £42. The assets were estimated at £4,336, from which had to be deducted £36 for preferential claims, leaving net assets of £4,300, or a deficiency of £1,418. It was reported that the company was formed on March 26th, 1924, with a nominal capital of £2,500, of which £1,228 in shares had been issued and paid for in cash, to take over the business of Radio Productions for a sum of £600. Accounts showed that from April,

1924, to April, 1925, the turnover was £26,593. There was a gross profit of £2,300 and a net loss of £116. The liquidator said that the company purchased heavily at the end of last year in anticipation of the Christmas trade, which, however, proved unsatisfactory. Creditors began to press and eventually the company was forced into liquidation. It was decided to confirm the voluntary liquidation of the company with Mr. Baker as liquidator. A committee of inspection was also nominated. The following are creditors :—

| | £ | | £ |
|---|---|---|---|
| Beard & Fitch ... ... ... | 89 | Igranic Electric Co., Ltd. ... | 185 |
| Carr & Child ... ... ... | 95 | Ward & Goldstone, Ltd. ... ... | 58 |
| Clarke & Co. ... ... ... | 116 | Sellers, — ... ... ... ... | 501 |
| Brown, S. G., Ltd. ... ... | 87 | Radions, Ltd. ... ... ... | 151 |
| Birkbys ... ... ... ... | 90 | St. Helens Cable & Rubber Co., | |
| Electric Supplies ... ... ... | 31 | Ltd. ... ... ... ... ... | 130 |
| Fellowes Magneto Co. ... ... | 80 | Tele-Radio ... ... ... ... | 236 |
| Goswell Engineering Co. ... | 104 | Lighting, Heating & Glass Co., | |
| W. T. Henley's Telegraph Works | | Ltd. ... ... ... ... ... | 189 |
| Co., Ltd. ... ... ... ... | 81 | | |

Standard Cable Manufacturing Co., Ltd.—Supplemental dividend of 1½d. in the £, payable at Carey Street, W.C.

B. D. S. Wireless, Ltd.—Winding up voluntarily. Liquidator, Mr. H. G. Willmot 147, Corporation Street, Birmingham. A meeting of creditors was called for to-day at the Liquidator's offices.

East Anglian Electricity, Ltd., Felixstowe.—Meeting of creditors May 22nd, at Ipswich. Creditors to send particulars of debts, &c., to the Liquidator, Mr. C. P. Dawes, 30, The Broadway, Orwell Road, Felixstowe, by June 5th. The liquidation is being carried out under the terms of a reconstruction arrangement, under which a new company is to be formed (the East Anglian Electric Supply Co., Ltd.) for the acquisition of all or any of the undertaking, property, assets and liabilities.

Wireless Warehouses, Ltd.—Winding up voluntarily. Liquidators, Mr. P. S. Booth, Kimberley House, Holborn Viaduct, E.C., and Mr. C. Latham, Dundee House, 15, Eastcheap, E.C.

Singapore Electric Tramways, Ltd.—Particulars of claims to the Liquidator, Sir W. Plender, 5, London Wall Buildings, E.C., by July 31st.

Farndons Power & General Electrical Co., Ltd.—A meeting of members is called for June 20th, at 47, Temple Row, Birmingham, to hear an account of the winding up from the Liquidator, Mr. P. H. Stone.

**Dissolutions of Partnership.**—Henderson & Sowden, electrical engineers and contractors, &c., 24, Market Place, Reading.—Mr. H. R. Henderson and Mr. S. W. Sowden have dissolved partnership. Mr. Henderson will attend to debts and continue the business on his own account.

Central Wireless Co., wireless dealers, 6, Market Place, Radcliffe.—Mr. H. Hall and Mr. G. W. Heys have dissolved partnership. Mr. Hall will attend to debts and continue the business under the same style.

**Private Arrangements.**—A. J. Singlehurst, trading as the Cogent Electrical Co., Berry Street, Liverpool, electrician.—A meeting of creditors was held recently, at the offices of Messrs. G. H. Thompson and Son, Liverpool, when a statement of affairs was submitted which showed liabilities of £2,985, made up as follows :—Trade creditors £793, and cash creditors £2,157. The assets totalled £476, from which had to be deducted preferential claims of £26, leaving net assets of £450. The debtor had been in business for a number of years, and up to November, 1923, was in partnership. A dissolution then took place, and the two retiring partners received the amount due to them. It appeared that after allowing for the depreciation written off in the statement of affairs the debtor had lost approximately £1,600 during the past 16 months, while his drawings had not been more than £6 per week. The turnover had been in the neighbourhood of £60 per week, and the debtor stated that he had lost a considerable amount on contracts. An offer was made of a composition of 10s. in the £, payable over a period of 12 months, but without guarantee. Eventually it was decided to adjourn the meeting.

The following are creditors :—

| | £ | | £ |
|---|---|---|---|
| Rowe Bros. & Co., Ltd. ... ... | 40 | British Thomson-Houston Co., | |
| Downes & Davies ... ... ... | 44 | Ltd. ... ... ... ... | 44 |
| General Electric Co., Ltd. ... | 49 | Hart Accumulator Co., Ltd. ... | 40 |
| Ward & Goldstone, Ltd. ... ... | 45 | B. and B. Wireless Co. ... ... | 45 |
| Rose Bros. ... ... ... | 20 | Holloway Bros. ... ... ... | 27 |

R. H. W. Gough and H. Smith, 4, Waterloo Road, Epsom, electrical engineers.—A meeting of the creditors of the above was held recently at the offices of Messrs. Theodore Bell & Co., Cannon Street, E.C., when the chair was occupied by Mr. P. Houston, representing the Presland Electric Co., the largest trade creditors. The solicitors said that no accountant had got out the figures, and the few figures he had before him were given by one of the creditors who had investigated the books. The liabilities amounted to, roughly, £600, and the assets to £400. The partnership was commenced in June, 1924, and there was a third partner, who subsequently became a limited partner. In order to carry on the business a loan of £200 was obtained, and that amount was now shown in the liabilities. The present position was attributed to (1) an electrician who was employed by the partnership turned out his work very unsatisfactorily, and consequently it had to be put right, sometimes at considerable loss to the partners; and (2) faulty cable which was supplied some time ago. It was resolved that the matter should be dealt with under a deed of assignment with Mr. W. Osborn, of Messrs. Corfield and Cripwell, as trustee, together with a committee of inspection, consisting of Mr. E. H. Hawkins, representing creditors, Mr. E. Judd, for the Sun Electrical Co., Mr. Pratt, of the Surrey Wholesale Electrical Co., and the representative of the Presland Electrical Co.

The following are creditors :—

| | £ | | £ |
|---|---|---|---|
| Petters, Ltd. ... ... ... | 42 | Presland Electrical Co. ... ... | 230 |
| Surrey Wholesale Electrical Co. | 114 | Sun Electrical Co., Ltd. ... | 74 |
| Radio Instruments, Ltd. ... | 35 | Woodcote Motor Co. ... ... | 54 |

E. Cuthbertson, trading as Cuthbertson & Co., 29, Scarborough Street, West Hartlepool, plumber and electrician.—The creditors interested herein were called together recently at the offices of Messrs. J. H. Smith & Graham, when a statement of affairs was submitted which disclosed liabilities of £1,053, made up as follows :—Trade creditors £514, cash creditor £200, and partly-secured creditor £349; the total claim of the partly-secured creditor (the bank) was £796, and the estimated value of the security was £448. The assets totalled £467, from which had to be deducted £82 for preferential claims, leaving net assets of £385. It was reported that the debtor had been in business for over 20 years, and he attributed his present position to serious ill-health and severe trade depression. Several creditors had commenced proceedings, and a deed of assignment had been executed in order to protect the estate. The debtor hoped to obtain assistance from friends, which would enable him to offer 5s. in the £. A resolution was passed in favour of the matter being dealt with under a deed of assignment in favour of Mr. H. Groves, of Messrs. W. T. Walton & Son, and the trustee was authorised to sell the assets to the debtor for such a sum as would pay a dividend of 5s. in the £.

The following are creditors :—

| | £ | | £ |
|---|---|---|---|
| British Insulated & Helsby Cables, Ltd. ... ... ... | 100 | Liverpool Electric Cable Co., Ltd. ... ... ... | 23 |
| British Thomson-Houston Co., Ltd. ... ... ... ... | 68 | Simplex Conduits, Ltd. ... ... | 21 |
| Lumbys, Ltd. ... ... ... | 34 | Walsall Hardware Manufacturing Co., Ltd. ... ... ... | 23 |

**Catalogues and Lists.**—The Morley Electrical Engineering Co., Ltd., Troy Works, Stanningley, Leeds.—A well-illustrated booklet giving details of the company's oil-immersed a.c. and d.c. mining controllers.

Messrs. Falk, Stadelmann & Co., Ltd., 83-87, Farringdon Road, E.C.1.—An illustrated and priced catalogue of "Antarctic" electric fans of all patterns.

Soldo Co., Sicilian House, Southampton Row, London, W.C.1.—Brochure containing a report of the National Physical Laboratory on "Soldo" patent tinning compound.

Fuller's United Electric Works, Ltd., Woodland Works, Chadwell Heath, Essex.—A folder illustrating examples of the company's radio transformers. Priced.

Messrs. Rhodes, Bryan & Youatt, Ltd., Waterloo Road, Stockport. — An illustrated pamphlet describing the "Mopump," a combined electric motor and pump.

Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester.—List No. 210, containing particulars and prices of automobile wires and cables, lighting apparatus, switches, plug testers, &c.

Messrs. T. C. Jones & Co., Ltd., Shepherd's Bush, W.12.—A very comprehensive catalogue (487 pp.) of hand and machine tools. The interpretation of this description is a broad one, and includes such apparatus as steam traps and valves, bearings, pumps, &c. The list is fully illustrated and priced.

Messrs. George Green & Co., 40, George Street, Manchester Square, W.1.—Leaflets illustrating and describing immersion heaters and electric wash boilers. Priced.

The English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.—Publication No. 471, illustrating and describing truck-type switchboards; Publication No. 340, illustrating examples of the company's winding installations; and Publication No. 494, illustrating and describing electric locomotive equipments.

Messrs. Alfred Herbert & Co., Ltd., Coventry.—An illustrated handbook for operators of the "Lucigraph" photographic copying machine.

Messrs. Hans Renold, Ltd., Burnage Works, Didsbury, Manchester.—A pamphlet illustrating chain drives for printing presses.

Siemens & English Electric Lamp Co., Ltd., 38 & 39, Upper Thames Street, E.C.4.—May price list of electrical materials and appliances. Also Price List No. 78, containing illustrations and details of "Silvaray" one-piece glassware lighting fittings.

Messrs. Crompton & Co., Ltd., Chelmsford.—An illustrated booklet describing the company's a.c. motors in general terms. A wide variety of types is dealt with.

Messrs. S. Bill & Co., Ltd., Queen's Road, Aston, Birmingham.—A priced and illustrated catalogue of "Botrade" switches and fuses of various designs and combinations.

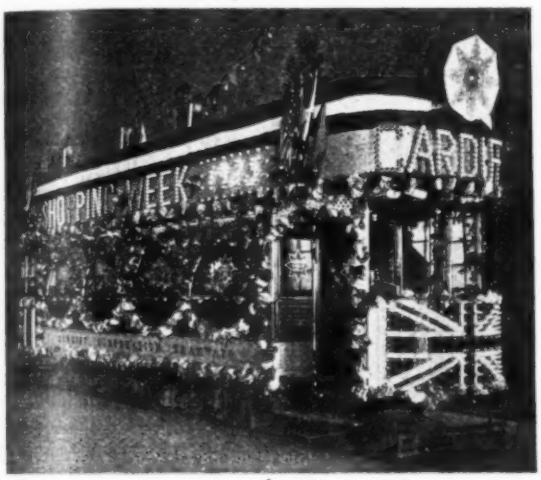
Messrs. Reavell & Co., Ltd., Ranelagh Works, Ipswich.—Pamphlet No. 127, illustrating and describing vertical double-acting air compressors.

**Works Visit.**—A party of American and Canadian radio experimenters recently paid a visit to the factory of the Mullard Radio Valve Co., Ltd.

**Norwegian High-Pressure Apparatus.**—The Norwegian State Water Power and Electricity Administration has placed an order with the Norsk Elektrisk & Brown-Boveri for the electrical apparatus for the State power station at the Nore. The installation will have a working pressure of 132,000 volts and will be carried out as an aerial line; apparatus for such a pressure has not hitherto been made in Norway.

**A Permanent United States Exhibition.**—The Department of Overseas Trade informs us that the President of the United States has extended an invitation to all foreign countries to participate in a permanent international trade exhibition which is to be opened at New Orleans in September. The scope of the exhibition is a very comprehensive one representative of all classes of goods. Among those specifically mentioned are electrical appliances, machinery, radio apparatus, and household utensils. A copy of a pamphlet containing full information may be consulted by interested parties at the Department's offices, 2, Queen Anne's Gate Buildings, S.W.1.

**An Illuminated Tramcar.**—During the recent shopping festival at Cardiff the Corporation decked one of its cars in a very effective manner for touring the city. A large proportion of the lighting scheme was carried out with low-voltage lamps arranged 36 in series on the traction supply voltage. The




**An Illuminated Cardiff Tramcar.**

lamps were tinted in various colours to harmonise with the decorations and, as will be seen from the accompanying illustration, the result was strikingly successful. All the electric lamps, lacquer, cable, and lampholders were of "Siemens" manufacture.

**Unemployment.**—On May 4th, the number of persons registered as wholly unemployed was 1,179,800, *viz.*, men 903,300, boys 36,200, women 207,400, and girls 32,900. The figure shows a reduction of 7,270 on the week, but an increase of 139,140 during the past twelve months—principally men.

**Trade Facilities Guarantees.**—A recently-issued White Paper shows that further guarantees have been made under the Trade Facilities Acts, increasing the total amount guaranteed to £55,577,811, of which £1,129,325 has been repaid, reducing the responsibility of the Treasury to £54,448,486. The latest guarantees include:—£500,000 on account of the North British Aluminium Co., for the equipment of a power station and factory; £300,000 for the Tcho Electric Power Co. for the purchase of machinery and materials in Great Britain for the extension of electrical plant in Japan; £20,000 for the Brentwood District Electric Co. for the extension of electricity supply; £100,000 for the Sudan Light & Power Co. for the purchase of machinery and materials in Great Britain for the improvement and extension of public utility undertakings in the Sudan; £100,000 for the Dunstable Portland Cement Co. for the erection and equipment of cement works; £26,000 for the Ascot Gas & Electricity Co. for mains extensions; and £200,000 for the Mersey Power Co. for the installation of additional plant and the extension of supply.

**District Industrial Council.**—The annual meeting of District Council (No. 2) for the Electricity Supply Industry (Yorkshire, &c.), was held on May 11th at Leeds. The annual report was adopted and members of the Council were elected for the year ending May 1st, 1926. On the same day an ordinary meeting was held and Ald. E. J. Dowson (Doncaster) was appointed chairman and Mr. W. H. Proudler (National Union of Enginemen, &c.) deputy chairman, for the ensuing year. An Anomalies Committee was also appointed.

**Copper, Lead and Rubber Prices.**—Messrs. F. Smith and Co. report, May 19th:—Copper (electrolytic) bars, £64 5s., 5s. decrease; do., do., sheets, no change; do., do., wire rods, £74 5s., 5s. decrease; do., do., h.c. wire, no change.

Messrs. James & Shakespeare report, May 19th:—Copper bars (best selected) sheet and rod, £90, £1 decrease; English pig lead, £33 10s., 25s. decrease.

Messrs. E. Till & Co. report, May 19th:—Indiarubber, Para fine, 2s. 1¼d., 6¼d. increase on last week's price.

**For Sale.**—Blackburn Corporation Electricity Department has for disposal surplus generating plant, &c., lying at the Jubilee Street distribution station. By order of the Receiver of Corona Lamp Works, Messrs. H. Butcher and Co. will sell by auction on June 4th, at 10, Ascham Street, Kentish Town, N.W., plant, machinery, tools, &c., including dynamos, motors, rotary blowers, pumps, &c. King's Lynn Corporation has for disposal one 200-kW Belliss Laurence-Scott generating set, with condenser. Salford Borough Council Electricity Department invites offers for overload relays and automatic oil switches. Keighley Corporation Fire Brigade Department has for disposal 22 wall and table-type telephones and a 40-line switchboard. Messrs. Fuller, Horsey, Sons & Cassell invite offers for plant and machinery, including a 600-kW Fraser & Chalmers turbo-alternator, with condensing plant, a 300-kW G.E.C. alternator, with condensing plant, transformers, motors, water-tube boilers, pumps, &c. Maindy and Eastern Workmen's Institute, Ton Pentre, Rhondda, invites offers for a Westinghouse 19-b.h.p. gas engine generating plant. By direction of the Air Ministry, Messrs. Horne & Co. will sell by auction on Monday, June 8th, and following days, at the Air Ministry depôt, Watford, machine and hand tools, electrical plant and machinery, and stores. (See our advertisement pages to-day.)

**German Enterprise in Luxemburg.**—The report of the Société Luxembourgeoise pour Entreprises Electriques (Solpee), which is said to be controlled by the Berlin A.E.G., states that although the uncertain political conditions continued unfavourably to influence the activity of the company in 1924, it was possible to get a number of good orders from abroad. Including 12,000 fr. brought forward the amount of 404,000 fr. at disposal permits of a distribution of a dividend of 11 per cent.

**Lead.**—Reporting on May 16th, Messrs. James Forster and Co. stated that a large consumption was going on, but there was plenty of lead to meet it, though arrivals this month, so far, showed a falling-off in comparison with those in April. The Board of Trade returns for April were:—Imports, 23,775 tons; exports, 1,706 tons, leaving for home consumption 22,069 tons.

**Local Exhibitions.**—HARWICH.—The Electricity Committee held an electrical exhibition at the Drill Hall, Dovercourt, from May 12th to 16th. Some particulars of the display will appear in our next issue.

WOKING.—Reference was made in our last issue to an exhibition which was arranged by the Woking Electric Supply Co., Ltd., at Shepperton, to which district the company has recently extended its supply. The accompanying illustration

**A Corner of the Shepperton Exhibition.**

shows a corner of this exhibition. It is of interest as showing that the use of electricity for cooking is not necessarily a privilege of larger towns. The card gives details showing that the cost of cooking a fairly large dinner was very reasonable, and the exhibit also demonstrates the cleanliness and convenience of electric cooking.

**Chinese Notes.**—The value of electrical goods imported into the Kwantung Leased Territory (Dairen) during 1924 was about two million Haikwan taels (about £367,000).

The Yung Yao Electrical Supply Co. has recently been started in Peking Road, Shanghai.

To meet the increased demand for which its present plant is inadequate, the Nanling Electric Light Co., Anhwei, has recently ordered new machinery from abroad.

An electric lighting company has been inaugurated at Kutien (Fukien province) with a capital of $26,000. The plant is capable of providing energy for 2 500 lamps.

The Yangchow Telephone Administration is planning the extension of the telephone service to Taichow and Tsingkianpo, distances of 100 li and 300 li, respectively. (The li is about 580 yd.)

**New Australian Companies.**—Crossley Bros. (Australasia), Ltd., has been registered in Australia, with a capital of £10,000, to carry on the business of importers, exporters, and manufacturers of and dealers in engines.

Electrolux, Ltd., has been formed, with a capital of £5,000, as electrical and mechanical engineers and manufacturers.

The Furnace & Power Plant Construction Co. (Australia), Ltd., recently registered with a head office at Sydney (N.S.W.), has a capital of £250,000.

**Electricity Supply Employés' Wages.**—The Colchester Town Council has decided to increase the wages of those workmen in the electricity supply department now receiving £3 per week and under by 2s. per week.

The employés of electricity supply undertakings in Sussex, Hampshire, and Dorset recently applied for an increase of 6s. per week in their wages. The matter has been considered by the Industrial Court, which has made an award of 2s. per week. About 1,200 employés are affected.

**The Buenos Aires Works.**—The directors of the Compania Hispano-Americana de Electricidad, of Madrid, which recently obtained authority to increase the share capital from 120,000,000 pesetas to 160 000,000 pesetas, is now about to issue the new shares to existing proprietors. The proceeds of the issue are intended to provide part of the funds for the erection of a new steam power station at Buenos Aires of an eventual capacity of 500,000 kW, of which plant for 125,000 kW will form the first instalment.

**Credit Insurance Proposals by the F.B.I.**—A report upon the subject of credit insurance as a means of increasing export trade has been presented to the Government by the Federation of British Industries. At the outset, the report says that the instability of post-war conditions, and in many cases the reduced capital resources of the exporting firms, together with the greater demands upon these resources, due to the post-war increase in prices, have rendered it far more difficult to grant credits to foreign buyers than it was before the war. The Federation makes it clear that the aim is not so much insurance against eventual loss from bad debts, but the obtaining of greater financial facilities in dealing with business which involves more than a normal trading risk. Risks of loss occasioned by war, revolution or other disaster cannot be defined and re-insured separately. They can only be re-insured as excess risks, *i.e.*, a maximum figure must be taken which should be well above any conceivable loss which could occur in the normal course of business. The excess loss above this maximum should be the subject of special re-insurance. It is suggested that this special re-insurance should, for several reasons, be undertaken by the Government on the following principles: That the Government should agree to re-insure for a small premium an agreed proportion of all the losses above an agreed amount in any one year on credits insured in respect of goods of United Kingdom origin by any approved company or companies. It is thought that the risk should be extremely small and that the Government would, by the adoption of such a scheme, improve its revenue, reduce unemployment, strengthen the sterling exchange by an improvement in the trade balance, and be gradually relieved of the responsibility and difficulty involved in operating the existing Export Credits scheme.

Proposals are put forward for dealing with such matters as the invalidation of a policy owing to the giving of false information or the suppression of information which should have been given. Two classes of credit which require insuring are distinguished, *viz.*, short-term credits up to a maximum of, say, six months, and credits for one, two, or even three years. The latter are required frequently by purchasers of power plant, machinery, railway rolling stock, &c. While an insurance system such as the foregoing would undoubtedly facilitate the granting of these longer-term credits, it seems probable that further provision of a more financial character may be necessary. The Federation proposes, after further consideration, to lay its views on this point before the Government at a later date.

**Norwegian Radio Exhibition.**—The Acting British Consul at Oslo has informed the Department of Overseas Trade that, according to a local Press announcement, an exhibition of radio goods will be held, under the auspices of the Radio Goods Dealers' Association and the Norwegian Radio Union, in Oslo from September 1st to 15th next. The exhibition will include foreign and Norwegian goods, and apparatus sent in by Norwegian amateurs through their local radio clubs.

**French Foreign Electrical Trade.**—The United States Commercial Attaché at Paris reports that exports of electrical generating equipment from France during the first two months of this year totalled 646 metric tons, while imports reached 483 tons. During the same period exports of other electrical equipment amounted to 981 tons, against imports of 186 tons. The domestic market for electrical equipment and apparatus was also very active and French manufacturers had many orders on hand.

**Italian Investigations in Sweden.**—An Italian deputation composed of twelve members is at present on a visit to Sweden for the purpose of investigating the questions of telephone installations, the utilisation of water powers, &c. The deputation is headed by Prof. Ponti, engineer and professor at the University of Turin, who is connected with large Italian supply companies and with the company which is to take over the local telephone exchanges in Italy next July. Visits are also being paid to electrical manufacturing works in Sweden.

**Sydney (N.S.W.) and Preference in Tenders.**—At a meeting of the Sydney City Council in March, Mr. Forbes Mackay, city electrical engineer, reported that he had further investigated the matter of the tenders for the supply of rubber-insulated wires and cables, as the representatives of all the British makers had been tendering at the same price when tenders were called. The representatives of the British firms had informed him that, in response to cabled advice from England, they had quoted the prices mentioned in their tenders. An alderman said it was clear that in this matter there was a combine, and he moved that fresh tenders be called; and that with regard to this particular matter, tenders be invited from all makers of insulated cables throughout the world, and that no preference be shown to the firms in the British combine "other than that of merit." The resolution, with this addendum, was approved by the committee.

The *Sydney Morning Herald* report of the same meeting states that the question of granting preference to Australian electrical machinery was raised. Mr. Mackay asked for a decision in advance, as about £1,000,000 worth of machinery would be required for the new power station in the next few years. After discussion it was decided that no preference should be allowed, other than that provided by the Customs tariff.

**Book Notices.**—"The Elements of Machine Design," by S. J. Berard and E. O. Walters. Pp. x+323; figs. 244. London: Blackie & Son, Ltd. Price 10s. net.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIII, May, 1925. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

**The Electrical Imports of British Malaya.**—A summary of the electrical imports of British Malaya during 1924 was given in a recent issue of the *Board of Trade Journal*. This showed that the total value of electrical goods and apparatus imported was £263,286, of which Great Britain supplied £222,545, the Continent £17,672, and the United States £13,947. The imports of electrical machinery were valued at £116,222 (Great Britain £73,583, the Continent £10,983, and the United States £29,638). In the following items alone does any serious foreign competition appear:—Electric motors to the number of 356, and valued at £32,172, were imported from the United Kingdom, while the United States sent 360 valued at £27,750. In the case of electric lamps and parts, imports from the United Kingdom were 94,501, valued at £7,667, and from the Continent of Europe 137,475, valued at £7,489. Batteries and accumulators from the United Kingdom numbered 12,880, valued at £5,332, while the United States sent 21,572, valued at £5,375.

**Works Extension.**—Messrs. Nalder Bros. & Thompson, Ltd., have added a new bay to their instrument shop at Lane Works, 97a, Dalston Lane, London, E.8, to enable them to cope with the increased demand for their apparatus which they have experienced during the past two years.

**British Trade-mark Applications.**—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 13th. In the case of foreign applications, the names and addresses of the British representatives are also given.

Titan. No. 449,771. Class 6. Electric motors, dynamos, &c.—Kiesled, Hauberg, Marstrand & Helweg Aktieselskabet, 32, Tagensvej, Copenhagen, Denmark. (J. E. Evans-Jackson & Co., 57-60, Holborn Viaduct, E.C.1.)

Quasi-Arc (lettering and design). No. 455,325. Class 6. Electric dynamos, motors, &c. No. 455,326. Class 8. Electrical testing apparatus, electrical resistances, reactances, inductances, and transformers, electrically-fitted switchboards, &c.—The Quasi-Arc Co., Ltd., 15, Grosvenor Gardens, Westminster, S.W.1.

Polywog Brand Trade Mark (lettering and design). No. 453,142. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony, but not including accumulators.—C. R. Oliver, 786, Fulham Road, S.W.6.

Sloktun. No. 455,746. All goods in Class 8.—D. Macadie, 109, Bowes Road, Palmer's Green, N.13.

Divo. No. 455,930. Class 8. Detector crystals and crystal detectors for use in radio-telephony.—M. Masel, 20, High Street, Romford, Essex.

Theila. No. 457,042. Class 8. Apparatus for use in connection with radio-telegraphy and telephony.—H. F. Bowers and E. Bowers, trading in co-partnership, 23, Herries Street, Queen's Park, W.10.

Superial. No. 457,166. Class 8. Radio-telephonic and telegraphic apparatus.—The New London Electron Works, Ltd., Boleyn Road, Barking Road, East Ham, E.6.

Resicon. No. 457,357. Class 8. Electrical condensers.—Thorp Roderick, Ltd., 12, Balsall Street, Bedford.

Nora. No. 457,430. Class 8. Apparatus for radio-telephony.—Nora Elektrizitäts Gesellschaft, 39, Wilmersdorfer Strasse, Charlottenburg, Germany. (Henry Fairbrother, 30-32, Ludgate Hill, E.C.4.)

Wireless Apparatus (lettering and design). No. 456,048. Class 8. "Wireless telephonic and telegraphic instruments and apparatus, and parts thereof.—H. C. Tofield, Ltd., 10, Newmarket Street, Birmingham.

Cygnus. No. 457,461. Class 8. Loud speakers.—La Compagnie pour la Fabrication de Compteurs et Materiel d'Usines à Gaz, 12, Place des Etats Unis, Montrouge, Seine, France. (Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2.)

Safetee (lettering and design). No. 455,940. Class 13. Electric switches.—L. Weekes, Ltd., 13, Langley Street, Luton, Beds.

Sanco. No. 456,643. Class 13. Electric junction boxes of metal.—George H. Scholes & Co., Ltd., 27, Blantyre Street, Chester Road, Manchester.

Adnil. No. 457,609. Class 13. Electrical switchboards (ordinary), electrical contacts, terminals, cut-outs, electric lampholders, electric lamp pendants and fittings, sparking plugs, electric lamps (ordinary), &c.—S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.

**Cold Galvanising.**—The Anglo-Galvanising Co., Ltd., has sent us particulars of the "Bianco" process of galvanising iron or steel in a cold bath by electrodeposition; it is claimed that the electrolyte never needs any renewal except the addition of distilled water, being regenerated completely from the anodes, and copies of letters from users appear to bear this out. It is stated that the deposited zinc is uniform in thickness and firmly adherent. The company owns the sole rights of the process.

**Belgian Duty on Carbons Reduced.**—The Belgian authorities have reduced the import duty on "carbons prepared for electricity without parts of metal or other materials, weighing 50 kg. and more each" by the removal of the "co-efficient of increase" upon the minimum duty of 10 ft. per 100 kg.

**New French Company.**—Under the auspices of French and American capitalists, a new electrical undertaking financing concern has just been formed in Paris (39, Avenue de Friedland), with a capital of 25 million fr., and the title La Société Financière pour le Developpement de l'Electricité.

**German Industry during April.** — The Commercial Secretary at Berlin (Mr. J. W. F. Thelwall) has forwarded to the Department of Overseas Trade a review, based on the reports of the Prussian Chambers of Commerce, of the trade and industry of Germany during April. Opinion regarding the economic situation in April is not uniform. Although, on the one hand, there were indications of an improvement, particularly in the iron and machinery industry, and in the electrotechnical industry, on the other hand the serious sales crisis in the coal industry continued, depression still prevailed in the ship-building industry, and the trade balance was again unfavourable, though it improved somewhat as compared with March. In the electrotechnical industry the influx of inland orders continued satisfactory. Foreign sales still amount to only about one-third of the pre-war sales, although much more attention than formerly is being paid to foreign trade. The advancing tendency of prices was maintained. Price increases by at most 20 per cent. were unavoidable in order to prevent losses. Wages were increased.

**Football.**—The Chloride Electrical Storage Co.'s Rugby team has succeeded in winning a challenge cup presented by Messrs. E. Hulton & Co., Ltd., Manchester. The team beat the Manchester Ship Canal (No. 9 Dock) team in the final on May 11th by 8 points to 5.

**A German Company's Report.**—The report of the Voigt and Haeffner Company, of Frankfort-on-Main, for 1924, states that the staff of officials was reduced by about one-third during the year and thorough measures of economy were carried out wherever possible. At the same time preparations were made for better times by extending the inland and foreign circles of representatives and developing the internal organisation of the works in every direction by diminishing the number of types, the standardising of parts, and the perfection of manufacturing methods. A development again started in the autumn and this placed difficult problems before the company in individual branches from a manufacturing point of view. It was possible again to increase the number of employed by 800 down to the time of the preparation of the report, and it is assumed that if the trade continues favourable the number will be further increased. The favourable movement applies solely to the inland market and is a consequence of the overcoming of the former lack of confidence. On the other hand the export trade is rendered extraordinarily difficult or even impossible owing to import duties. As previously reported, the results permit of the payment of a dividend at the rate of 8 per cent. on the ordinary shares.

**The London Chamber of Commerce.**—The annual meeting of this body was held on May 13th, when the report for the year 1924 was adopted. The report is a record of many and diverse activities touching all phases of trade. Among the matters dealt with during the year was the question of electricity prices in the City, the result of the Chamber's representations being a certain reduction which, however, was not considered wholly satisfactory. The chairman of the London Telephone Advisory Committee (Sir William Purchase) died during the year and his place was taken by Sir Stephen Killik. The Committee reports that after it had been in communication with the General Post Office some time, the charges for calls were reduced in July last. Another matter mentioned in the report is the rating of machinery which the manufacturers' section condemns as hindering industrial development. The Petroleum and Allied Trades Section appointed three representatives to the B.E.S.A. Sub-Committee on Insulating Oils during the year.

**New South African Customs Tariff.**—The new Customs tariff which the Union of South Africa proposes to adopt was published as a supplement to the *Board of Trade Journal* of May 14th.

**American Accumulator Exports.**—A total of 238,153 storage batteries, representing a market value of £573,970, were exported by American manufacturers in 1924. This compares with 163,840 batteries, valued at £468,318, in 1923. The biggest markets for American batteries proved to be Argentina, which led the list with purchases totalling £69,662 in value; Canada with £65,363; Australia, £47,623; Brazil, £44,992; Belgium, £40,532; Great Britain, £39,249; Cuba, £28,146; Denmark, £27,575; South Africa, £26,533; New Zealand, £25,352; India, £23,467; Mexico, £19,842; and Italy, £14,172.

**Industrial Conciliation.**—We are pleased to learn that at last the fusion of the National Alliance of Employers and Employed, and of the Industrial Reconstruction Council is assured. The matter was frequently discussed in these pages a year or two ago, and it will be remembered that the efforts made at that date to bring about amalgamation were not successful. At the annual general meeting of the National Alliance, held last week, under the chairmanship of Sir Edward Manville, a completer co-ordination of those bodies formed to promote the principles of industrial conciliation was deemed desirable, and the terms of an agreement for the amalgamation of the two bodies mentioned were endorsed.

The objects and programme of the new organisation remain the same as those of the amalgamating bodies, brought together under a single control. That control will be vested in joint committees composed in equal numbers of employers and trade union representatives, but the associate membership is open to all individuals who accept the principles and Constitution. Both the Alliance and the League have been at work for nearly nine years. An indispensable preliminary to a return to industrial prosperity is stability resulting from industrial peace. The new body is to be the centre of a great movement to organise the efforts of all in agreement with that principle. Lord Balfour of Burleigh presided over the amalgamation proceedings. Mr. E. F. Leicester is the general secretary, and all interested in the movement are asked to communicate with him at 25, Queen Anne's Gate, S.W.1.

**A Quality Mark for French Electrical Goods.**—In order to combat a tendency towards the lowering of the quality of electrical machinery and apparatus so as to be able to offer goods at a lower price. The French Syndicat des Constructeurs d'Appareillage et de Matériel Electrique, in conjunction with the Union des Syndicats de l'Electricité has decided on the adoption of the letters "U.S.E." as a quality mark for French electrical goods. It is proposed that as from the beginning of July next this mark shall be stamped on such productions as receive the approval of a special examining jury.

**Valve Price Reductions.**—We are informed that the reductions in the prices of radio valves which were announced in our last issue commenced with the "Cosmos" valves made by the Metropolitan-Vickers Electrical Co., Ltd. (which last week announced a "further" cut), the object being to stimulate the growth of "listening in" by bringing valve reception within the reach of a larger number of people. The company is allowing the trade full credit for all "Cosmos" valves remaining in stock at the date of the reductions.

## Lighting and Power Notes.

**Andover.**—ELECTRICITY SUPPLY.—The Town Council has granted the application of the Western Electric Distributing Corporation, Ltd., for permission to use overhead wires in certain streets in the Borough. The Corporation is to submit an estimate for supplying electricity for pumping at the sewage pumping station.

**Argentina.**—ELECTRICAL DEVELOPMENT.—Excellent progress was made during the past year by the Société d'Electricité de Rosario, the number of consumers having advanced from 29,810, representing 35,104 kW, to 33,627 and 38,130 kW, respectively. The sales of electrical energy during 1924 amounted to 37,636,131 kWh, as against 33,135,967 kWh in 1923. In order to meet the growing demand, further extensions are taking place at the power station, where four new boilers and a 17,000-kW turbo-alternator are expected to be ready for operation by June next.

**Barnsley.**—ELECTRICITY CHARGES.—The Electricity Committee has recommended to the Town Council that an optional two-part all-in tariff be put into operation for residential property as follows:—15 per cent. of net rateable value per annum, charged quarterly, plus 1d. per kWh for all energy consumed for both light and domestic purposes, less 5 per cent. on accounts paid within one month. It is also recommended that the existing "unit" charge on the maximum demand system in operation for large power consumers be reduced by 0.1d. per kWh.

MAINS EXTENSIONS.—The Committee has decided on mains extensions in Park Road and the erection of a sub-station at Sheffield Road at a cost of £1,371, and also a.c. distributing mains at a cost of £1,600.

ELECTRICITY AGREEMENT.—The Council has agreed to terms with the Yorkshire Electric Power Co., with regard to the supply of energy in the Worsborough area.

**Blackburn.**—ELECTRICITY SUPPLY.—The Corporation Electricity Committee has approved an estimate, amounting to £14,500, for alterations to switchgear, control gear, protection cables, conduits, &c., at the Jubilee Street distributing station. Regarding the expenditure of £10,000 for the provision of electricity meters, the Committee has decided to purchase these meters from revenue as and when required.

**Bradford.** — LOANS SANCTIONED. — The Corporation has received sanction to the borrowing of £19,970 for converting plant, switchgear and extension to the Thornbury and Odsal sub-station buildings, and £2,635 for a transformer chamber in Listerhills Road.

**Carlisle.**—LOANS.—The Town Council is applying for sanction for loans of £7,957 for mains extensions and £5,000 for meters.

**China.**—TIENTSIN.—The report on the working of the British Municipal Council's electricity undertaking (engineer and manager: Mr. R. A. Williams) for the year ended December 31st last shows a total revenue of taels 260,495. Working ex-

penses amounted to taels 99,981, and, after allowing for depreciation, there was a gross profit of taels 125,365. The final result was a net surplus of taels 85,649. The sales of electrical energy amounted to 2,916,352 kWh, an increase of 26 per cent., as compared with the previous year, and the maximum supply demanded rose from 1,350 to 1,530 kW. During the year a Metropolitan-Vickers 2,500-kW turbo-generator was installed, raising the capacity of the station to 5,000 kW. An additional boiler was also added to the plant.

**Continental.**—BELGIUM.—La Société Financière de Transports, of Brussels, has secured the concession for the electrification of the Belgian Cantons of Malmedy and Saint Vith and for the utilisation of the water power in that district, which is estimated to amount to about 10,000 h.p.

The Société Centrale Electrique de Zeebrugge is establishing a central electricity station, which will be operated by the surplus gas from coke ovens. The distribution of the energy generated will be undertaken by the Société des Centrales Electriques de Flandres.

FRANCE.—Practically the whole of the electrical undertakings supplying the Paris suburban area are now furnishing a 50-cycle supply, only a few concerns retaining the 25-period a.c. supply. In the Greater Paris area a change over from 41.66 to 50 cycles has been carried through, while negotiations are in hand for a similar alteration in the inner Paris area.

GERMANY.—Work has lately been completed on the erection of a large new power station at Zaborze, Upper Silesia, for the Silesian Gas & Electricity Co. The current, which is produced at 6,000 V, by A.E.G. steam turbo-alternators, is to be stepped up to 60,000 V for transmission to Zawadski and Gleiwitz, a distance of about 28 miles.

**Crewe.**—ELECTRICITY EXTENSIONS.—The Town Council has decided to give a supply of electricity to the Crewe Chimney Housing site at an estimate cost of £4,199.

**Ellesmere.** — ELECTRICITY SUPPLY. — The Urban District Council has accepted a draft agreement with the Gwynedd Trust to supply the town with electricity.

**Gillingham (Kent).** — LOANS SANCTIONED. — The Town Council has received loans of £3 885 for mains, and £4,500 for converting plant.

**Ilminster.**—OPPOSITION TO ORDER.—The Urban District Council has decided to oppose the application of the Bridport and District Electricity Co. for a Special Order to supply electricity to the town.

**India.**—ELECTRICAL DEVELOPMENT.—According to the *Indian and Eastern Engineer*, the towns of Broach, Navsari and Dabhoi have made considerable progress in the utilisation of electricity for lighting and power purposes. At Broach, there are now 900 consumers and 15 miles of overhead line. The plant consists of two 150-b.h.p. Mirrlees-Diesel oil engines direct-coupled to Mather & Platt alternating current 440-volt generators. Further extensions are being undertaken. At Navsari the number of consumers has increased to 425, and more than eight miles of public street lighting has been carried out on behalf of the Municipality. The Dabhoi Company, which commenced operations only six months ago, has 225 consumers and is increasing its plant. The report of the directors of the Surat Electricity Co. states that as the load of the power station has practically attained the maximum capacity of the plant installed, it is intended to raise a further capital of Rs. 5 lacs to increase the plant from 450 to 1,000 h.p. and lay distribution mains through all important streets in Surat.

**Irish Free State.**—THE LIFFEY POWER SCHEME.—A conference between members of the Free State Government and The Dublin City Administrative Commission is being arranged for the consideration of the Corporation's Hydro-Electric Bill, which recently passed the Private Bill Committee. There appears to be some prospect of the Bill being taken over by the Government and the scheme embodied in the proposals under the Shannon Electricity Bill.

**King's Lynn.**—LOAN.—The Town Council is applying for sanction to a loan of £12,256 for the following purposes:—Boiler-house extensions, £8,000; mains, £2,000; excess expenditure on previous loan, £2,256.

**Lanarkshire.**—ELECTRICITY FOR HOUSING ESTATE.—The Upper Ward District Committee's housing scheme at Douglas Water is to be provided with electricity. Wallace Town Engineering Co., Ayr, is to be asked to tender for the work.

**Lichfield.**—ELECTRICITY AGREEMENTS.—The City Council has approved agreements with the Walsall Corporation for the supply of electricity to the city, and with the War Office for the supply of electricity by the city to Whittington Barracks.

**London.**—STOKE NEWINGTON.—Next Thursday afternoon the Mayor will formally open the electricity showrooms and the latest extensions at the electricity works.

ST. PANCRAS.—The Electricity Committee has recommended to the Borough Council that an agreement be entered into with the Islington Borough Council for the linking-up of the power stations of the two Councils. The scheme will necessitate the laying of two 3-phase mains capable of running at 11,000 V, 50 cycles, and one 2-way duct to permit of further extensions at a later date. The cost is estimated at £6,700, and application is to be made for sanction to a loan.

COOKING BY ELECTRICITY.—The London County Council has arranged for the installation of electric cookers for experimental purposes at cookery centres in Poplar, Woolwich, and Hackney.

**Manchester.**—PROGRESS DURING MARCH.—The net increase in the connections to the Corporation's supply system during March was 1,531 kW, bringing the total to 247,531 kW. In addition, applications representing 1,817 kW were received. The number of hired cookers connected was 45, making a total of 678, and applications for a further 44 were received. The output during the month increased by 18.5 per cent., as compared with March, 1924, the total being 30,309,000 kWh.

COMPLETION OF VOLTAGE CONVERSION.—The work of gradually changing consumers' services from 100 to 200 V, which was commenced on a small scale in 1908, has now been completed.

FUTURE EXTENSIONS.—It is stated that the present plant will suffice to meet the normal demands up to and including the winter of 1927-8, but additional plant must be available for the following year. Contracts for new plant and buildings forming the first instalment of the second half of the Barton station should be placed in the early part of 1926. In the meantime the Electricity Committee has decided to invite tenders for the last boiler in the No. 1 (existing) boiler house. The installation of this unit has been deferred owing to the trade depression.

LOANS SANCTIONED.—Sanction has been received by the Corporation to the borrowing of £41,000 for sub-station buildings and £13,550 for sub-station equipment.

**New Mill (Yorks.).**—EXTENSION OF SUPPLY.—At a recent meeting of the Urban District Council a petition of residents of Hade Edge was received, asking the Council to extend its electricity service to that area, and the Council instructed the engineer to prepare a scheme for an extension.

**Plymouth.**—INQUIRY.—The inquiry by the Electricity Commissioners into the applications of the Corporation, Plympton Rural Council, and Messrs. Hurrell & Heath, with regard to the supply of electricity to the Plympton district was recently resumed at Whitehall by Lieut.-Col. Ekin, Chief Inspector. The inquiry had been adjourned to see whether it was possible for terms to be agreed upon under which the Plympton Council should purchase Messrs. Hurrell & Heath's undertaking. Mr. Harker, on behalf of the Plympton Council, stated that negotiations had taken place and the Council had been advised to agree to certain terms. The purchase price was £7,000. With regard to the cost of bulk supply the result of negotiations had been a reduction of the kW charge to £5 10s. and the "unit" charge to 0.786d. Mr. Spencer Hawes, who has been advising the Plympton Council with regard to its electricity supply, gave details of a scheme which had been drawn up, the capital expenditure of which would be nearly £40,000, excluding the purchase price of £7,000. He stated that a canvass of the residents of Compton Gifford showed that they were willing to pay 1½d. per kWh for electricity from the Plympton Rural District Council, which was the estimated cost in his scheme, even though Plymouth was supplying at 4½d. per kWh. Mr. S. F. Lee, ex-chairman of the Plympton Rural District Council, said 1,200 residents had promised to take a supply of electricity from his Council. The inquiry was adjourned *sine die* so far as the application of the Plympton Council and Messrs. Hurrell & Heath were concerned, so that the inspector might be made fully aware of the terms of the agreement, and as regards the Plymouth application the inquiry was concluded.

**Sheffield.**—LOAN.—The Town Council is applying for sanction to a loan of £27,394 to complete the electricity mains for the whole of the Manor Housing Estate.

NEW SUB-STATION.—A site has been purchased in Gleadless Road for the erection of a sub-station.

**Sleaford.**—LOAN.—The Urban District Council has applied for sanction to a loan of £1,200 for additional plant and buildings at the electricity works.

**Sunderland.**—STREET LIGHTING.—The Town Council has adopted a scheme presented by the Electricity Committee for taking over the whole of the street lighting of the borough, the total cost to be £114,746. Application will be made for sanction to the borrowing of the capital sum involved and to the Unemployment Grants Committee for a grant towards the cost of the scheme.

ELECTRICITY EXTENSIONS.—The Electricity Committee is to carry out extensions of mains and erect a sub-station on the Barley Mow estate, at an estimated cost of £2,807 and £1,357 respectively.

**Torquay.** — LOAN SANCTIONED. — The Town Council has received sanction to borrow £5,000 for mains and services.

**United States.**—ELECTRICAL DEVELOPMENT.—According to *Power*, progress is rapidly being made on the new 60,000-kW Harbor Point station of the Utica Gas & Electric Co. It is expected that the plant will be put into operation during January, 1926. The structure is being built for a capacity of 60,000 kW, but only two 15,000-kW turbo-generators will be installed at first. These will be followed later by a 30 000-kW set. The complete development based on the available cooling water will permit of an ultimate development of 150,000-kW.

Construction of another high-head hydro-electric plant to cost $8,500,000, the first of six units, on the Middle Fork of the Feather River, in Butte County, Calif., will be started in a

few weeks by the Feather River Power Co. The effective head will be 2,400 ft. and the power house will have a capacity of 50,000 h.p. The five other plants, plans for which have already been drawn, will produce about 400,000 h.p. They will cost from $45,000,000 to $50,000,000.

**West Lothian.**—NEW PLANT.—The District Committee is borrowing £1,800 to cover the cost of installing plant at Uphall for electric lighting improvements. Electricity in bulk is to be obtained through an arrangement with the Scottish Midlands Electricity Supply Co. The present plant is obsolete.

**Winchester.**—NEW PLANT.—The Town Council has approved of the following extensions to the electricity works:—One turbo-generator set of 1,250 kW capacity, with condensing plant and accessories; an additional 24,500 lb. boiler; extension to economiser; and extension of boiler-house and engine-room. The estimated total cost of the extensions is £19,000.

## Tramway and Railway Notes.

**Bradford.**—TRACK RENEWALS.—At a meeting of the Tramways Committee recently it was reported that the Ministry of Transport had sanctioned a loan of £44,878 for the reconstruction of the tramway track on portions of the Allerton and Great Horton sections.

**Bolton.**—TRAMWAY IMPROVEMENTS.—The Corporation Tramways Committee is to carry out, subject to the consent of the Ministry of Transport, the provision of two additional loops on the Brownlow Fold tram route, and has decided to proceed with the laying of a double tramway track in place of the existing single track in Great Moor Street.

**Continental.**—SWEDEN.—The engineering works at Motala, Falun and Trollhaettan have now turned out one electric locomotive each for use on the electric railway between Stockholm and Gothenburg. After June 1st one locomotive is to be delivered by each works every fortnight; the railway's order for a total of 50 locomotives will thus be completed by next January.—*Reuter's Trade Service* (Stockholm).

CZECHO-SLOVAKIA.—*Commerce Reports* states that the Railway Ministry has established a special bureau to study the question of railway electrification and to draw up plans for the partial electrification of the State railways. It has been decided that direct current at 1,500 V will be most advantageous. The initial plans contemplate the electrification of the Wilson railway station and the partial electrification of the railway stations at Smichov, Nusle, Liben, Visocane, and the interconnecting sections, including two tunnels. As the scheme will cost about 50,000,000 Czech crowns, the work will probably be divided among several firms. The next project will be the Smichov-Zdice section which will require various intermediary stations. Further development is also expected in the railway network surrounding Prague, and in the Zdice-Plzen section. The plans indicate that the hydro-electric station now being constructed at Stechovice will be used to supply the energy for the last-named section.

The municipal authorities of Prague have recently placed a contract for the supply of 80 trailer cars for the city electric tramways with the Ringhoffer Engineering Works.

RUSSIA.—At a recent meeting of the Gosplan (State Planning Commission) it was decided to begin work on the electrification of the Moscow suburban railways, and the Commissariat of Ways and Communications was requested to proceed at once with the preparation of a plan so that work could be started in October, the beginning of the next fiscal year. An expert is to be sent abroad to study questions connected with the electrification of railways.—*Reuter's Trade Service* (Moscow).

SPAIN.—Application has been made to the Spanish Government for a concession to construct and work an electric railway between Barcelona and Prat de Llobegrat.

The Sociedad Madrilena de Tranvias has recently placed orders for 50 new motor-equipped tramcars, of which a portion has already been delivered.

**Glasgow.**—PURCHASE OF PLANT.—The Corporation tramway manager having reported that the Department had ceased to take electrical energy from the Paisley Corporation for working the tramways forming the Paisley undertaking, the Tramways Committee has agreed that payment of the sum of £18,000, authorised to be paid to the Paisley Corporation in respect of electrical plant to be taken over by the Department, be now made.

**Rochdale.**—PURCHASE OF UNDERTAKING.—Under an agreement which has been arrived at by the Corporation and other neighbouring authorities for the purchase of the tramways of the Middleton Electric Traction Co., Ltd., the Corporation proposes to acquire the local section of the undertaking. A special meeting of the Council will be held to confirm the proposal.

**Liverpool.**—BATTERY-DRIVEN BUS.—The Corporation Tramways Department has recently put into service a battery-driven omnibus to seat 25 persons. It is intended to be used as a relief unit on busy motor 'bus routes, at times when available loads are in excess of the carrying capacity of service vehicles. The omnibus is built on a 3½-ton Walker Model P chassis, equipped with Exide Ironclad batteries of the I.M.V. 10 type with a capacity of 323 Ah at 60 V. The total weight of the chassis with batteries is 5,600 lb.

**London.**—BANK STATION COMPLETED.—The whole of the alterations and improvements to the Bank Underground Station are now completed. The traffic at the station is now at the rate of 10,000,000 passengers per annum, whilst the interchange traffic with the City Railway at this point amounts to over 3,000,000 annually. The three escalators have a "rush-hour" capacity of 24,300 passengers.

LINKING-UP SCHEME.—Some time ago a scheme was formulated for connecting the City and South London and the Piccadilly tubes in the vicinity of King's Cross, so as to facilitate exchange of stock between the two lines. Application is now being made to the Minister of Transport for an Order sanctioning the construction of this link. The line will be about 1¼ miles in length, and is to connect the westbound tunnel of the City and South London with the northbound tunnel of the London Electric.—*Modern Transport.*

**Sunderland.** — TRAMWAYS EXTENSIONS. — The Minister of Transport has made an Order authorising the Corporation to extend its tramway along Durham Road, from the Royalty to Burn Park Road, and to construct a loop line from Holmeside *via* Derwent Street.

## Telegraph and Telephone Notes.

**Australia.**—RADIO-TELEGRAPHY.—It will be remembered that, in order to facilitate the operation of its radio-telegraph services in competition with the existing cables, the Commonwealth Government handed over the operation of all its commercial radio services to a private company while retaining a sufficient measure of control through the board of directors. Some years ago Amalgamated Wireless (Australasia), Ltd., purchased the present and future patent rights of the world's principal systems, and it has since built up a large and successful Australian organisation for manufacturing, erecting, and operating all types of radio stations and services. At the present day the company employs more than 700 people, and it is claimed to be the second largest wireless organisation in the British Empire, says *The Times*. Three years ago the nominal capital of the company was raised to £1,000,000, comprising 1,000,000 shares, of which the Government subscribed for and took up 500,001 shares, while 499,999 shares are held by private shareholders in Australia, New Zealand, and Great Britain. The board now consists of seven directors, of whom three are appointed by the Government, three by the private shareholders, and the seventh director is appointed once in three years by a majority vote of the other six; in the case of an equality of votes the seventh director is appointed by arbitration. The company is to-day operating radio services at 28 land stations throughout Australia and New Guinea, and on nearly 200 ships of the Mercantile Marine, and it has also designed and erected and now operates broadcasting stations in the capital cities, and has extended its manufacturing works.

**Continental Telephony.**—LONG-DISTANCE EXPERIMENTS.—During the night of May 12th direct telephone communication between Rome and London was attempted. Actual connection was in fact made, but conversation was extremely difficult, many words being quite inaudible, says the *Morning Post*.

**Empire Radio Communication.**—STATION SITES.—A further step towards the realisation of inter-communication between the Dominions and Great Britain is the handing over by the Government of various sites in this country to Marconi's Wireless Telegraph Co., Ltd. Sites at Dorchester, Bodmin, and Bridgwater are now being cleared preparatory to the erection of the new buildings, planned by the Marconi Co. The erection of the new stations has been entrusted to the Foundation Co., Ltd. The Bridgwater and Bodmin stations will be utilised for communicating with Canada and South Africa, whilst it is intended to use the Dorchester station for transmitting messages to and from America.—*Daily Telegraph.*

**Finland.**—TELEGRAPH SERVICE.—The telegraph, telephone, and radio services are State owned, both the use and construction of the last-named being controlled by the Army Wireless Corps. The telegraph system has 20 automatic instruments in use, and its operating services are self-supporting. From Helsingfors as a centre there radiate three international direct services—the telegraph-telephone with Haparanda (Sweden) *via* Uleaborg and Tornea; a joint State-owned service with Reval (Esthonia), comprising three submarine telegraph and six submarine telephone cables; and a direct land telegraph service to Leningrad (Russia). The latter service, says the *T. & T. Age*, is further assured by a telegraph and radio convention signed between Finland and Russia in August, 1924; at the same time separate conventions provided for mutual efforts to restore or improve direct telephone and railway services between the two countries. International service is afforded also by the Great Northern Telegraph Co. (Danish), which operates three cables direct between Bromskarvik (a short distance north of Stockholm, Sweden) and Nystad (Finland), and another *via* the Aland Islands, as a part of its system linking Great Britain with Scandinavian and Baltic States and thence overland to the Far East.

# Radio Notes.

**A Short-Wave Record.**—20-METRE TRANSMISSION.—The Metropolitan-Vickers Electrical Co., Ltd., recently succeeded in spanning the globe with radio transmission at 21 metres. The transmissions were made from the experimental station (G2AC) at the Company's Research Department, Trafford Park, and the signals were picked up by Mr. Ralph Slade (Z4AG) of Dunedin, New Zealand. An interesting point is that the signals were received at noon, New Zealand time, so that by whatever route they travelled they must have covered half the distance in daylight. It is believed that this constitutes a record in that reception was carried out at the greatest number of wave-lengths distance from the transmitter yet achieved. The power input was 1.25 kW, and no reflector was employed during the test. It is proposed to continue the experiments with increased power and reflector aerials. The co-operation of amateurs and others who receive the signals would be welcomed; reports on reception should be addressed to Mr. A. P. M. Fleming, Research Department, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, England.

**Another Broadcasting Company?**—RIVAL PROPOSALS.—The Theatrical Managers' Association was to meet on May 19th to consider the proposals by the British Broadcasting Co. with regard to the broadcasting of plays. A rival scheme was to be placed before the managers by Secret Wireless, Ltd., the managing director of which, Mr. J. D. Chisholm, claims to have invented a system of "secret" broadcasting. "We have an experimental station at Birchington, Kent, which will be ready for experimental transmission in about twelve days," he stated. "If we came to an arrangement with the theatrical managers we could broadcast plays which could only be heard by those in possession of our patent component and of our weekly programme, which would give the wavelengths upon which we propose to broadcast each programme."—*Financial News.*

**Birmingham Station.**—NEW PLANT.—Early this summer the whole of the apparatus at the Birmingham broadcasting station is to be overhauled and a new transmitter installed; it is probable that at the same time the power of 5IT will be increased and that the modernisation will precede the removal of the station to new premises which are now being built in Broad Street. Two floors are to be taken, and an improvement will be the provision of two studios; one, 48 ft. by 40 ft., which will have a cubic capacity of 25,000 ft., will be used as a theatre for all orchestral performances, operas, and plays; it will provide accomodation for 200 people. The smaller studio, which will be 18 ft. by 14 ft., will be utilised for the women's and children's hour, for talks and auditions; it will accommodate 60 performers. The engineers are to have a control room, 20 ft. by 15 ft., while the administrative offices will be on the second floor. Both studios will be draped, but with much thinner material than has hitherto been used, since it has been found that this imparts a slight echo which is beneficial to the transmission.

**France.**—A NEW CRYSTAL.—Parisian radio enthusiasts are hopeful that a new substance to replace the galena crystal will prove to be something more than just another substitute. The substance was discovered by chance by Mr. Felix Thuaud, a prominent French steel manufacturer. While studying the by-products of steel, Mr. Thuand noticed a material that was something like the crystal used in radio sets. He tried a few pieces and heard over longer distances and with greater clearness than with galena points; also it was not necessary to hunt for special points of contact, as the new material was adequately sensitive at any point. The basis of the material is a combination of silicon and iron, with the former dominant. The product can be made in an electric furnace or in an ordinary crucible. It can be sold at about one fourth the price of substances now used.—*Science.*

**Italy.**—SPEECH AMPLIFIERS.—Loud speakers were used for the first time in St Peter's Cathedral in Rome during the service held there by the Pope on the occasion of the canonisation of Sister Teresa. Prayers, speech, and music were amplified from within the precincts of the Vatican for the benefit of people outside by means of Graham "public speech" equipment and "Amplion" loud speakers. The chief engineer of the Vatican has intimated that the Pope will be pleased if Messrs. Graham can arrange to repeat the amplification for the coming ceremonies.

**Oscillation.**—RADIO ASSOCIATION'S ACTION.—Oscillation and how to prevent it was discussed at a recent meeting of the executive of the Radio Association, held in the House of Commons. It was pointed out that the executive had received information to the effect that, owing to the increase of oscillation, the Post Office had in view drastic steps with regard to the use of reaction in radio receiving sets, and it was decided that a campaign against the nuisance should be instituted without delay. With the assistance of improved direction-finding apparatus definite information of persistent offenders could be obtained, and it was proposed to institute a test case against one or more offenders. The executive also decided that a deputation should be appointed to wait on the Postmaster-General and discuss the whole question of interference.

# Contracts Open and Closed.

*(The date given in parentheses at the end of the paragraph indicates the issue of the* ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

## Open.

**Australia.**—HOBART.—June 30th. Tasmanian Hydro-Electric Department. Material and erection of an 88 000-V transmission line of 59 miles from Waddamana to Railton.—*Reuter's Trade Service* (Melbourne).

**Belgium.**—June 3rd. Minister of Railways, Marine, Posts and Telegraphs. Telephone cables and accessories for Vise, Jodoigne, Tongres, Herve, Malmedy, Laroche-Luxemburg, Turnhout, Louvain, Malines, Viloorde, and Wijneghem.*

**Bentley-with-Arksey (Yorks.).**—May 27th. Urban District Council. Tubing, wiring, and electrical fittings of 46 houses. Mr. Frank Allen, clerk.

**Bredbury.**—Bredbury and Romiley Urban District Council. Transformers and switchgear. (See this issue.)

**Bridlington.**—May 25th. Electricity Department. 1,000 tons of washed smalls (coal). Tenders, stating calorific values and percentages of ash, to Borough Electrical Engineer, Electricity Works, Brett Street.

**Bristol.**—June 16th. Electricity Department. One 1,000-kW rotary or motor-converter. (See this issue.)

**Darlington.**—May 29th. Water Works Department. Six electrically-driven centrifugal or turbine pumps. (May 15th.)

**Dublin.**—May 27th. Office of Public Works. Alteration and extension of the electric lighting system at the Governor's residence, Phœnix Park. Specifications (20s.) from the Secretary, Office of Public Works, Dublin.

**Dundee.**—Corporation. Electric lighting installation at 216 houses. Specifications, &c., from Mr. George Baxter, Director of Housing.

**East Ham.**—June 13th. Education Committee. Installing electric light, Hartley Avenue and Sandringham Road schools. Mr. F. R. Thompson, secretary. (Returnable deposit of 10s.)

**Eccles.**—May 25th. Electricity Department. Twelve months' supply of a.c. meters. (May 15th.)

**Egypt.**—CAIRO.—June 24th. Egyptian State Railways, Telegraphs and Telephones. Supply of automatic telephones. Specification from the Inspecting Engineer's office in London.

**Hurst, Ashton-under-Lyne.**—May 26th. Electric light installation for Hurst Village Band Club, Evans Street. The secretary.

**India.**—June 9th. India Store Department. Three 120-kW, d.c., direct-coupled Belliss generating sets; 100-kW rotary converters, with transformers and starting gear. (See this issue.)

**Leeds.**—May 23rd. Board of Guardians. Electric lighting work at mentally defective wards extension, Union Infirmary, Beckett Street. Messrs. Chorley & Gribbon, architects, 3, Park Place, Leeds.

**London.**—H.M. OFFICE OF WORKS.—May 28th. Electrical cable and flex. (May 15th.)

HOLBORN.—June 10th. Board of Guardians. Electrical installation at the hospital, Archway Road, N. (See this issue.)

HAMMERSMITH.—June 12th. Electricity Department. One water-tube boiler, with mechanical stoker, feed pump, piping, &c.; two centrifugal pumps, strainers, valves, pipework, &c. (See this issue.)

**New Zealand.**—WELLINGTON.—July 7th. Post and Telegraph Department. Sub-station protectors.*

NAPIER.—August 10th. Harbour Board. Two electric capstans, electric portable crane, &c.*

**Plymouth.**—June 5th. Electricity Department. One 1,500-kW converter. (May 8th.)

**Sleaford.**—June 12th. Electricity Department. Two 300-b.h.p. crude oil engines with auxiliaries; two 200-kW d.c. generators; one 2-ton hand-operated overhead crane; switchboard and switchgear. (See this issue.)

**South Africa.**—JOHANNESBURG.—May 30th. Municipal Council. Street lamp fittings and electric lamps.*

June 20th. 6,600-V cable.*

PRETORIA.—June 17th. Union Tender Board. Supply of wireless telegraph equipment for wireless stations at Pretoria and Salisbury, Southern Rhodesia. Specifications and forms of tender from the Controller of Stores, G.P.O., Pretoria.—*South African Power Engineer.*

**Spalding.**—Urban District Council. Electricity generating plant, mains, transformers and meters. (May 15th.)

**Stoke-on-Trent.**—June 9th. Electricity Department. L.p. switchgear. (See this issue.)

**Turkey.**—CONSTANTINOPLE.—Post and Telegraph Department. Parts and chemicals for Leclanché cells.*

**Uruguay.**—MONTEVIDEO.—July 20th. State Electricity Works. Administracion del Puerto de Montevideo. Two electric cranes.*

**Weymouth.**—May 23rd. Electric light installation (42 houses), Westham, for the Town Council. Mr. G. Nicolson, borough electrical engineer.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

*(Continued on page 823.)*

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# Reconstruction of the Bow Power Station.

## The Charing Cross Company's Electricity Undertaking.

THE reconstruction of the Bow (London) generating station of the Charing Cross Electricity Supply Co., Ltd., was commenced in 1914, but the war prevented any real progress being made until 1919. All the original reciprocating plant has been shut down and most of it dismantled to make room for turbines, the policy being centred on certain salient features:—

(i) In 1919 the one set of existing condensing-water cooling towers was capable of dealing with one million gallons of water per hour (say, 12,000 kW of load). A second set of towers was erected in the first year of reconstruction, also for a million gallons of water, which safeguarded the station, but as the site could accommodate only a further small addition to the cooling plant, another solution was sought. At the back of the station there existed a partially silted-up branch of the River Lea, known as Pudding Mill Creek, which was dry at low water; the Lea itself is a locked river, so permission was obtained from the Lea Conservancy to build a dam across the creek opposite the power station. By making a new set of lock gates in the Lea and digging out the creek for 900 yards, locked water was brought close to the station. Four 27-in. pipes convey the water from the creek across a road into a single 48-in. bus-pipe in the pump-house (fig. 4), which is equipped with four Crompton motor-driven W. H. Allen centrifugal pumps that deliver the water through strainers (fig. 9), driven by B.T.-H. motors, into the tank of the cooling towers; the latter are not being used at present. The discharge returns by a 54-in. pipe into Bow Back River, another branch of the Lea. The system forms a loop some three miles in length, and the pumping plant can be extended to deal with from four to five million gallons, while, with the assistance of two towers, a total of from 6 to 7 million gallons per hour could be made available.

(ii) The old boilers operated at 175 lb. pressure, with a total temperature of 540 deg. F., and of the 18 Hornsby boilers, three of the vertical pattern were installed in 1900, being at that date the largest boilers in the world. The evaporative capacity was 100,000 lb. of water per hour, and their essential characteristics closely resemble the practice prevalent in America to-day. The boilers are only now being dismantled on account of the change in steam pressure; they evaporated, per unit of space, practically the same amount of water as present-day boilers, and are a remarkable instance of the foresight and courage of Mr. W. H. Patchell in installing boilers of this size and type so many years ago.

The seven new Babcock & Wilcox C.T.M.-type and

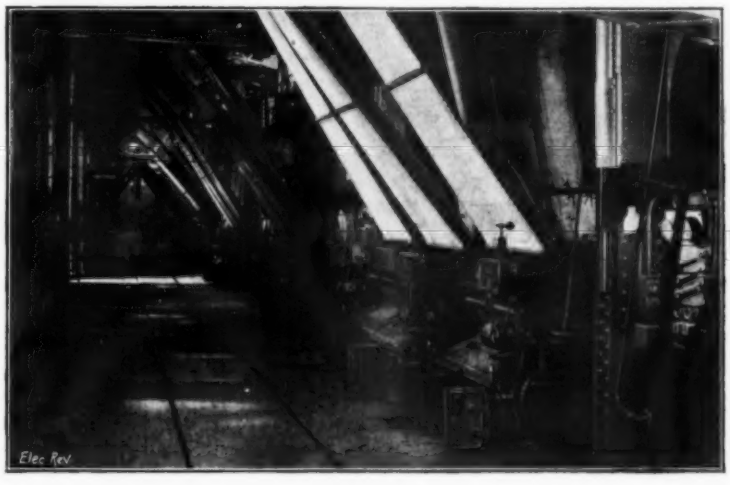



Fig. 2.—Boiler House.

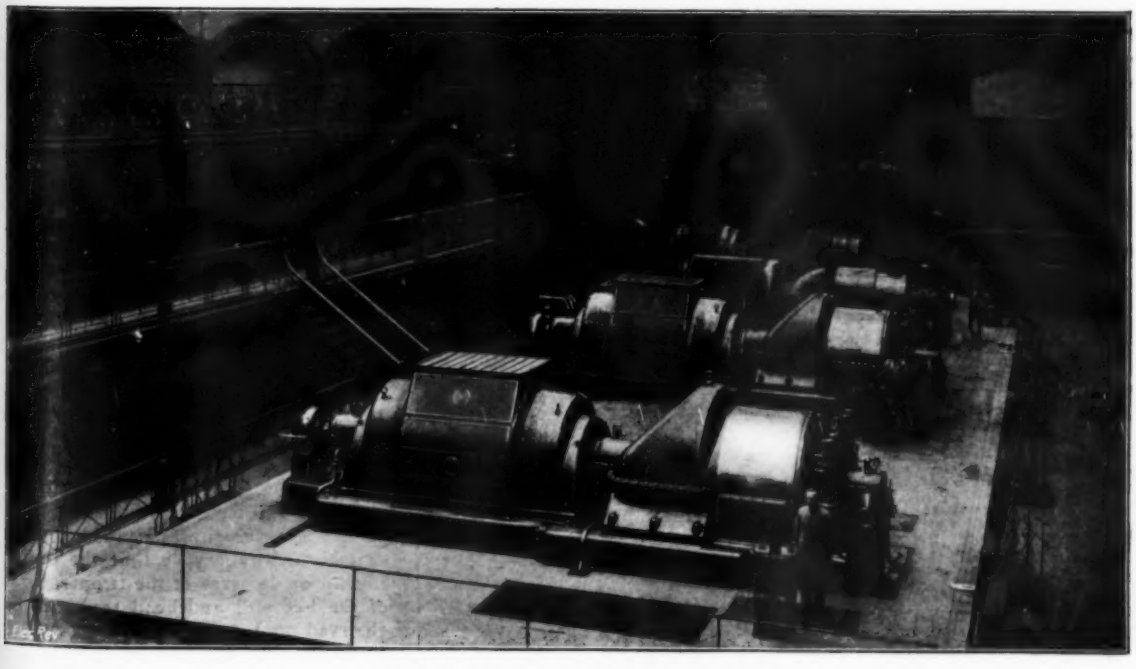



Fig. 1.—Turbo-Generator Room, Bow Power Station.

two Spearing boilers (fig. 2) each normally evaporates 55,000 lb. of water per hour at 265 lb. pressure, with a total temperature of 650 deg. F.; superheaters and economisers are fitted on all boilers. The Babcock and

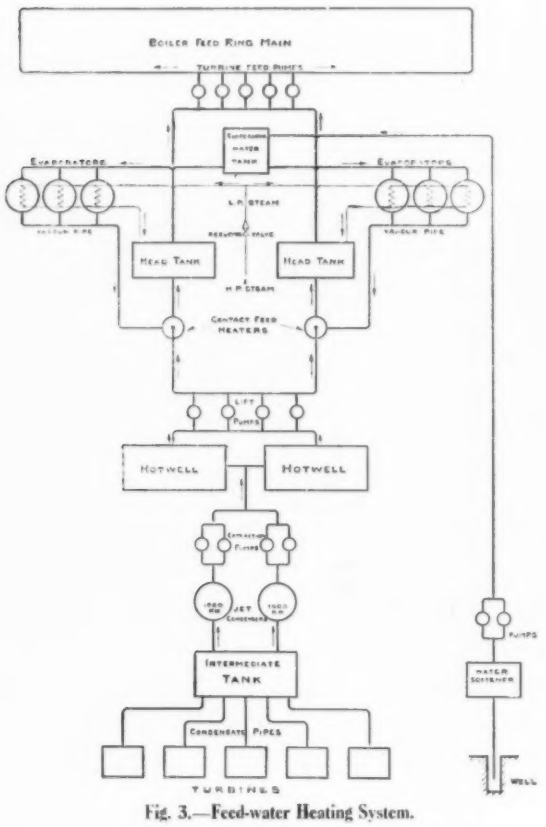



Fig. 3.—Feed-water Heating System.

Wilcox suction ash plant, driven by B.T.-H. motors, is new, but the coal-handling plant has been in use some time.

The general policy covered two other points in design: (iii) The old a.c. switchgear has been replaced with new Reyrolle switches of a much greater capacity, fig. 6 being a view of the switchboard, and (iv) it was decided to make all possible saving by a rearrangement

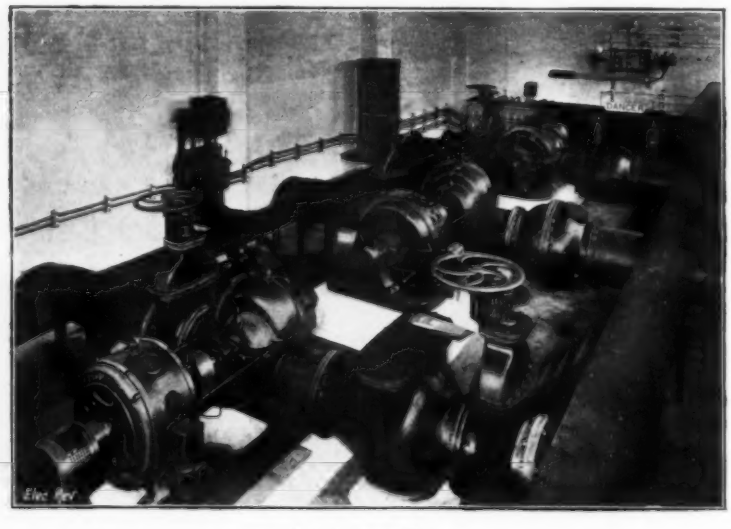


Fig. 4.—Pump House.

of the boiler feed-water heating system. Conditions did not permit of the adoption of the closed system and, for similar reasons, it was not possible to bleed the turbines. For the system adopted two auxiliary 1,000-kW W. H. Allen turbines, fitted with jet condensers, were installed (fig. 8). The whole of the condensate from the main turbines is delivered into a large intermediate tank, whence the water is sucked by the vacuum into the jet condensers of the auxiliary turbines, and the discharge is led into the hot well. It was calculated that the average temperature of the condensate would be about 90 deg., and it was desired to keep the hot-well temperature at about 150 deg. F. Therefore the water is pumped from the hot well to a head tank on the top bunker floor, whence it falls by gravity to the feed pumps, two sources of additional heat being used: First, the exhaust from the feed and lift pumps

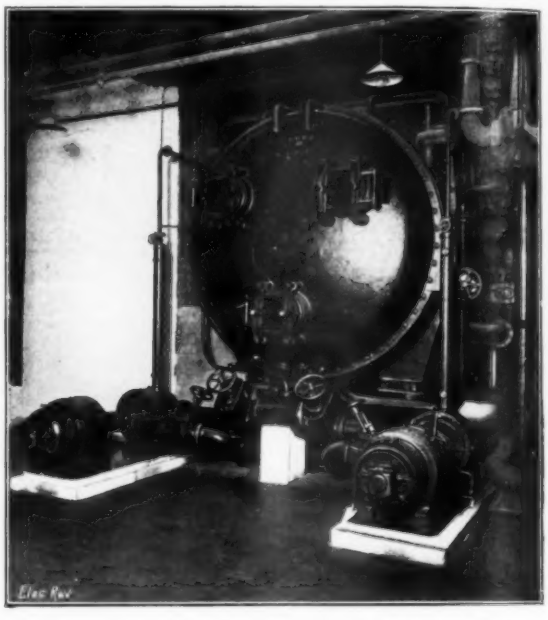


Fig. 5.—Condenser and Duplicate Extraction Pumps for 12,500-kW Set.

is discharged through nozzle heaters into the head tank and, secondly, the water from the hot well passes through a spray cooler, where it mixes with and condenses the vapour from the feed-water evaporators. The head tank is calculated to run at a temperature of 200 deg. F., and the system is shown in fig. 3.

The system of control for the temperatures of the hot well and head tank forms part of the auxiliary supply system; this circuit is direct current at 200 volts as originally laid down. To provide means for starting a turbine in case of a total shut down, two independent sets of bus-bars and two sources of supply are provided for the auxiliary service. The top set of bus-bars is supplied by two 1,000-kW motor generators, connected on the a.c. side to the 10,000-volt main bus-bars; the lower d.c. bars are supplied by two 1,000-kW turbo-generators, and the two sets of bus-bars are entirely independent, but the circuit switches are double throw and may be connected to either set of bars. Indicating temperature meters are provided on the switchboard gallery so that the building up or decrease of the temperatures of the hot well and head tank can be observed and switching arrangements made to suit. The boiler-house is fully equipped with measuring instruments, the indicators being fixed to the boiler fronts and the integrating and recording instruments grouped in a separate room. Each boiler is provided with a Lea coal meter, steam-flow, draught, and $CO_2$ indicators; in the pump-room are two large indicators, one for measuring the total water pumped into the boilers, and the other for the make-up. The central room contains recording $CO_2$

meters for each boiler, steam-flow integrators and recorders, flue gas and feed-water temperature indicators. Each turbine is provided with a stop valve temperature indicator, vacuum recorder, and circulating water inlet and discharge temperature indicators.

The generating sets installed comprise a 6,600-V, 6,000-kW, English Electric (Willans-Siemens) set; a

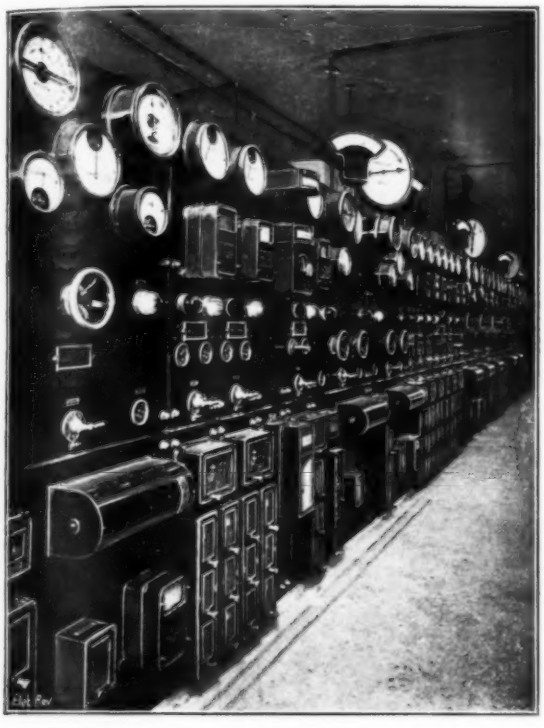


Fig. 6.—Main Switchboard.

10,000-V, 6,000-kW Parsons set, with Worthington condensing plant; and two Fraser & Chalmers-English Electric 10,000-V, 12,500-kW sets, with Allen condensers and duplicate pumps; all the generators are 3-phase, 50-cycle, 3,000-r.p.m. machines.

There is room for two more 15,000-kW sets, which will bring the total capacity of the plant installed up to 85,000 kW. The steam consumption of the turbines at their most economical load is given in Table I in the order of their installation, No. 6 set being in course of installation.

The cost per kilowatt of the whole of the new plant was £15 per kW, and (at prevailing prices) when two additional 16,000-kW sets and corresponding boilers have been installed—that is to say, when the present buildings are completely filled with modern plant, thus bringing the total capacity up to 85,000 kW—the cost will not exceed £13 per kW installed, inclusive of all foundations and additional building work, but exclusive of the original buildings. In 1914 the coal consumption per kWh delivered to the feeders was 4.8 lb.; in 1924 it had fallen to 2.42 lb., when the B.th.u. per kWh delivered to the feeders was 23,340 and the thermal efficiency of the station was 14.6 per cent.

The figures for 1925 will show a substantial improvement, for even in 1924 some reciprocating plant had to be run, and the feed-heating system was only in operation during the last month or two. Parsons lines for the station are shown in fig. 7. For the month of March, 1925, the thermal efficiency was 16.08 per cent.

Amongst the numerous contractors were the following:—Messrs. Electro Flow Meters Co.; Cambridge Instrument Co.; Metropolitan-Vickers Electrical Co.;

TABLE I.

| | M.C.R. kW. | | | lb./kWh at 80% load. |
|---|---|---|---|---|
| No. 14 | 6,000 | ... | ... | 14.9 |
| No. 3 | 6,000 | ... | ... | 13.7 |
| No. 4 | 12,500 | ... | ... | 10.72 |
| No. 5 | 12,500 | ... | ... | 10.70 |
| No. 6 | 16,000 | ... | ... | 10.03 |

Roto Plunge Co.; Hick, Hargreaves & Co.; Electric Construction Co.; Aiton & Co.; Kilmarnock Engineer-

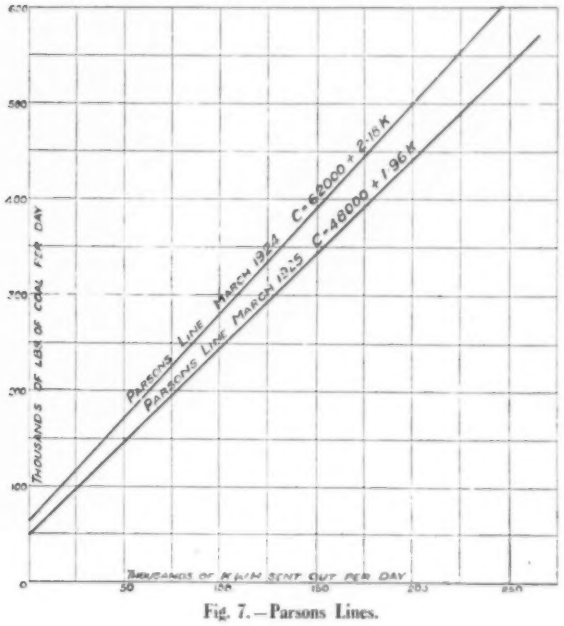



Fig. 7.—Parsons Lines.

ing Co.; Drysdale & Co.; Chloride Electrical Storage Co.; Empson Centrifugals, Ltd.; General Electric Co., Ltd.; Alley & McLellan; G. & J. Weir, Ltd.; Everett Edgcumbe & Co.; Davidson & Co.; Mirrlees, Watson and Co.; F. Braby & Co.; Reavell & Co.; British

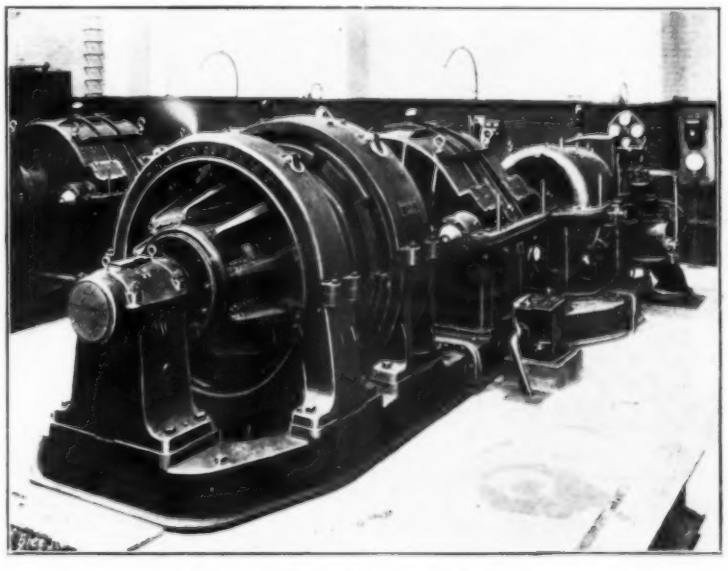


Fig. 8.—Auxiliary 1,000-kW Turbo-Generators.

Thomson-Houston Co.; J. B. Hall & Sons; Stothert and Pitt; Paterson Engineering Co. Messrs. Highfield and Roger Smith are the company's consulting engineers, and Mr. W. B. Thorpe is its engineer-in-chief.

It is of interest to recall that the genesis of this prosperous undertaking was due to the foresight of the

brothers Gatti, who in the old gas days embarked upon the production of electricity for lighting purposes at the Adelaide Galleries and the Adelphi. About the year 1891 the original generating station was in Maiden Lane; it soon developed, and in 1896 another station was built at Lambeth, while powers to supply electricity in the City of London were acquired in 1899. At that date the company's generating stations, including a third which was situated in Drury Lane, had a total capacity of about 5,000 kW, and the capital that had been expended on the undertaking amounted to about half a million sterling. Five years later, the plant capacity had been quadrupled, and the outlay had been increased to more than two millions. As evidence of the enterprise and ambition of the directors, it is interesting to note that in 1906 the company sought Parliamentary powers to supply electricity not only in Kensington, Westminster, Holborn, St. Pancras, and seven other Metropolitan Boroughs, but also in West Ham and East Ham, and a large part of the County of Essex. The reconstructed Bow station is the latest development of an enterprise that had so modest a start, and it was appropriate that the subsequent luncheon should have been served in the Adelaide Galleries of Gatti's Restaurant, Mr. W. F. Fladgate, who has been chairman of the company for 28 years, presiding, with the support of Mr. J. M. Gatti, managing director, and others.

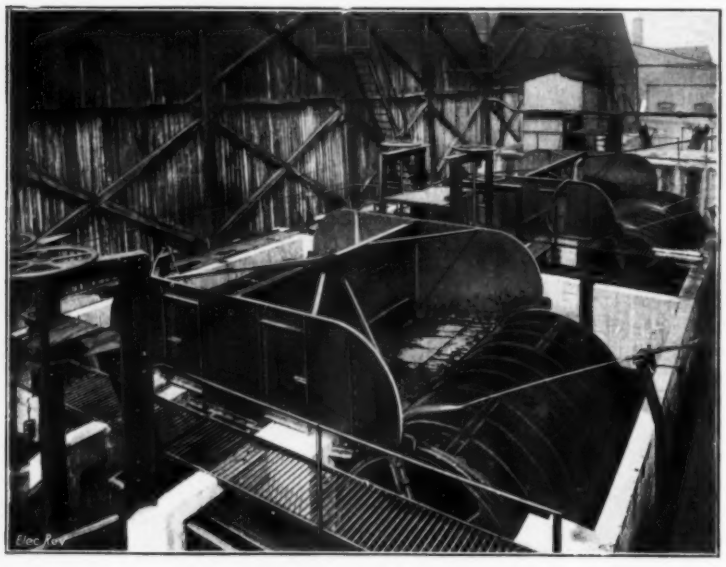


Fig. 9.—Water Strainers and Cleaning Jets.

# A New Electrically-Driven Omnibus.

## The Wigan Corporation's Trolley Vehicles.

On May 7th, the Wigan Corporation officially inaugurated an electric trolley 'bus service. The omnibus bodies were built by the Brush Electrical Engineering Co., Ltd., for Messrs. Clough, Smith & Co., Ltd., who supplied the vehicles to the Wigan Corporation tramway department. One of the new cars is illustrated in fig. 1, they being of the single-deck central-entrance type, arranged to seat thirty-seven passengers. The central entrance is in the form of a vestibule, which divides the body into two compartments, the seating being arranged to accommodate 13 passengers in the front compartment, 21 in the rear compartment, and three in the central vestibule. The seats are spring upholstered and covered with blue leather.

The body is constructed in accordance with the usual Brush practice, the framing being a combination of oak, ash, &c., with steel flitches and angle plates where required; the exterior panels are of mahogany. The windows are of plate glass, two in each compartment being arranged to drop, and provided with "Dura" balancing gear. Hinged glazed ventilators are provided above the side windows, and all the interior fittings are nickel plated.

The chassis is of the "Straker-Clough" single-motor type, and a "Holden" pneumatic suspension device is fitted between the body and the chassis. The overall length of each vehicle is 26 ft. This type of 'bus is rapidly increasing in popularity in this country.

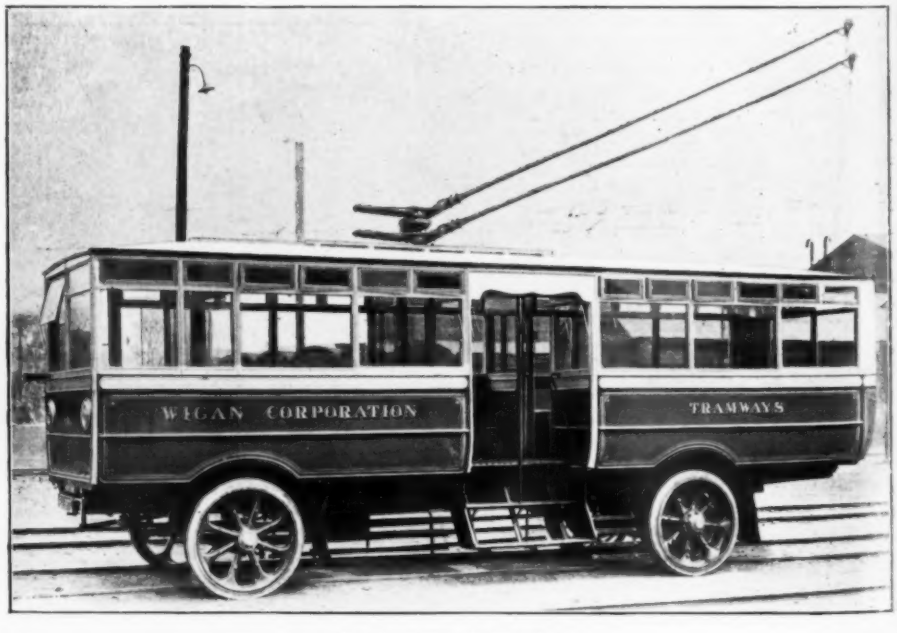
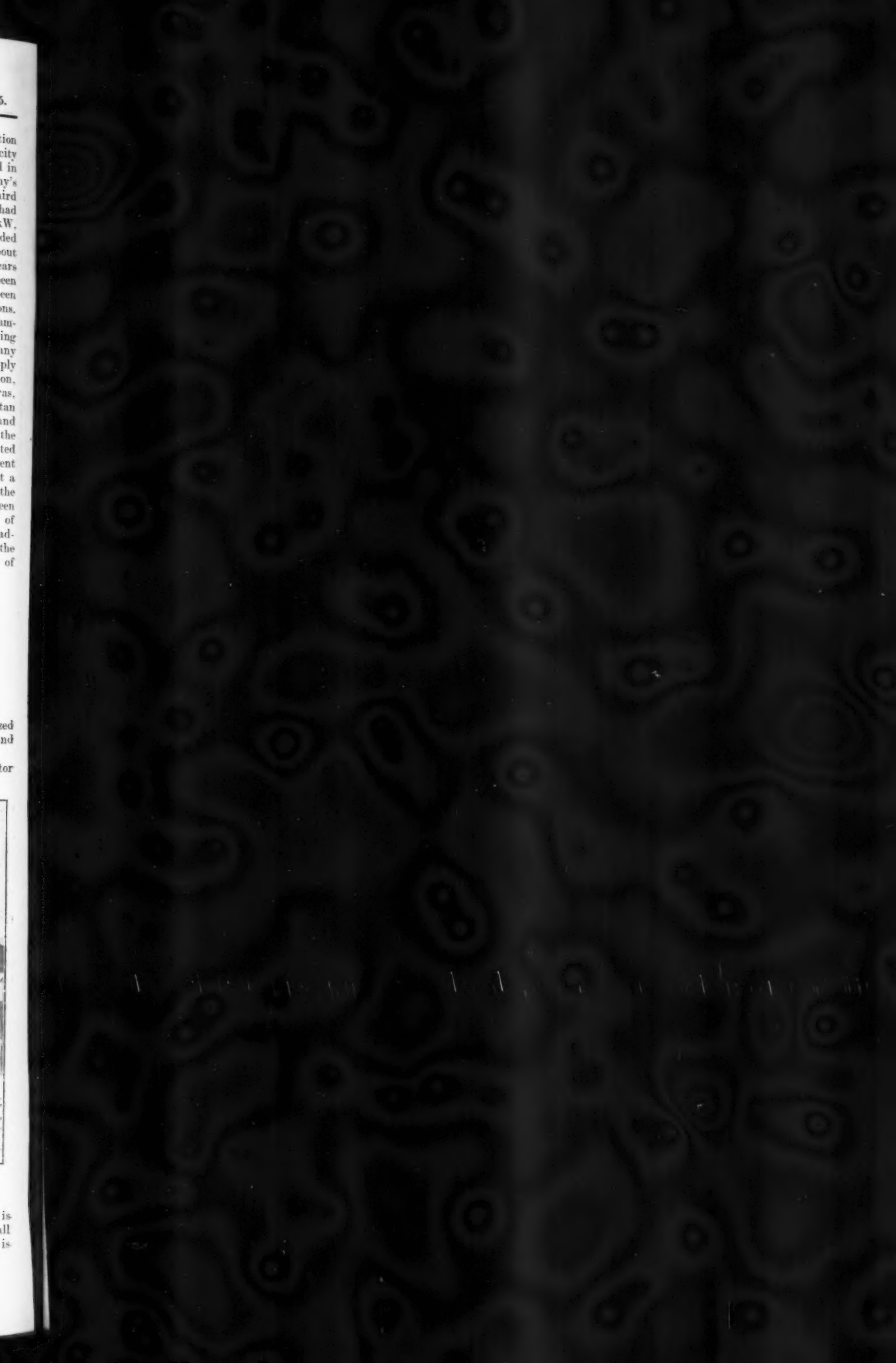



Fig. 1.—A New Trolley 'Bus.



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## Contracts Closed.

**Batley.**—Town Council. Accepted: —
Electrical installation at 20 houses.—J. F. Rispin & Co.

**Belgium.**—Belgian, French, Swiss, Danish, and British (Callender's Cable & Construction Co., Ltd.) concerns competed last week for Belgian State Railway contracts for bare and insulated electric cable. The lowest offers were, in each case, submitted by Belgian firms.

**Bradford.**—Electricity Committee.
Steel air ducts, Valley Road works.—R. Horsfield & Co., Leeds.
Centrifugal oil purifier, with pump.—Metropolitan-Vickers Electrical Co., Ltd.

**Burton-on-Trent.**—Electricity Committee. Accepted:—
Extension of mains to Gresley Common (£8,504).—Johnson & Phillips, Ltd.

**Carlisle.**—Electricity Committee. Accepted:—
Cables for 12 months.—British Insulated & Helsby Cables, Ltd.
Switchgear (£476).—British Thomson-Houston Co., Ltd.
High-pressure pipes (£3,060).—Stirling Boiler Co., Ltd.

**Glasgow.**—Lighting Committee. Recommended:—
Electrical fittings and accessories.—Chalmers & Mitchell; Simplex Conduits, Ltd.; W. Brown & Co. (Engineers), Ltd.; T. Land & Son; Sloan Electrical Co., Ltd.; Wm. M'Geoch & Co., Ltd.

**Gravesend.**—Electricity Committee. Recommended:—
Turbo-alternator (£17,060); switchgear (£2,042).—British Thomson-Houston Co., Ltd.
Boiler (£12,112).—Babcock & Wilcox, Ltd.

**Ipswich.**—Town Council. Accepted:—
Water-tube boiler, with forced draught, chimney, &c., complete (£11,610). —Babcock & Wilcox, Ltd.

**Lynn.**—Town Council. Accepted:—
2,000-kW turbo set, with accessories (£10,966).—Brush Electrical Engineering Co., Ltd.
750-kW converter (£3,058).—Bruce Peebles & Co., Ltd.

**London.**—LONDON, MIDLAND & SCOTTISH RAILWAY.
100 single-battery electrically-regulated train-lighting equipments.—Vickers, Ltd.

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON.—Contracts have been placed with the Foundation Co., Ltd., for the driving of escalator tunnels at South Wimbledon and Collier's Wood stations on the new Morden line extension, at an approximate cost of £50,000.

ISLINGTON.—Electricity Committee.
Ducts.—Turner & Lisney, Ltd. (Recommended.) Estimated cost, £2,040.

ST. PANCRAS.—Electricity and Public Lighting Committee. Recommended:—
Coal-conveying and elevating plant for the two Babcock & Wilcox boilers at the King's Road power house (£2,460).—Underfeed Stoker Co., Ltd.

**Rotherham.**—Tramways Committee. Accepted:—
Electrical equipment for tramcars (£4,075).—General Electric Co., Ltd.

**Sheffield.**—Electricity Committee. Accepted:—
Reinforced-concrete linings to steel bunkers at Neepsend (£486).—G. Longden & Sons, Ltd.

**Southport.**—Electricity Committee. Accepted:—
Two 400-kVA transformers (£642).—Hackbridge Electric Construction Co., Ltd.

GAS COMMITTEE.—The recommended tender for generator is that of the Electric Construction Co., Ltd., and not as rendered in our last issue (p. 577).

**Sunderland.**—Corporation.
Construction of an ash dock at Hylton Road electricity works.—Sir Robert McAlpine & Sons.

## Forthcoming Events.

**Institution of Electrical Engineers.**—WESTERN CENTRE.—Friday, May 22nd. Summer meeting at Dursley.

**Royal Institution of Great Britain.**—Tuesday, May 26th. At 21, Albemarle Street, W.1. At 5.15 p.m. Tyndall Lecture on "The Passage of Electricity Through Vacuum Tubes," by Prof. R. Whiddington.

## The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

FITZALL universal plugs for electric irons.
BIRKA flashing lamps.
WARDELOO watertight fittings.
PURCAR vacuum cleaners.
Electrically-driven lawn mowers.

## Notes.

**The Rutenberg Concession.**—The Jerusalem correspondent of the *Daily Mail* states that a deadlock has been created in Palestine and another blow has been dealt to the Rutenberg monopoly by the refusal of the Jaffa municipality to pay the bills for electric lighting with which the Zionist Rutenberg Company has presented it. The municipality bases its refusal on the fact that Mr. Pinhas Rutenberg was granted a concession for harnessing the River Audja, and, in consequence of the supposed technical difficulties of this, a high rate of payment for electricity was permitted. The river has never been harnessed. Two German Diesel engines have simply been installed in a shed, and for the energy these supply the high rate of charge has nevertheless been permitted. Some £6,000 in penalties which has accumulated concerning the non-erection of the power station does not appear to have been exacted, and mysterious extensions of the concession—the latest, quite recently, for a further six months—have been privately granted to Mr. Rutenberg. In the meantime the validity of the concession has been attacked by a Greek national.

**"Old Cromptonians'" Association.**—The newly-formed Association of Old Cromptonians held its first dinner at the Royal Automobile Club on May 15th, when Col. R. E. Crompton, C.B., presided over 53 members. After the loyal toasts, the gathering "swapped" reminiscences of old times. A lead-off by Col. Crompton in his very best vein was followed by tales of engineering adventures by Messrs. G. M. Clark, M.A., M.Inst.C.E., Col. Clibborn, C.I.E., S. G. L. Eustace, E. J. Fox, C. O. Grimshaw, M.Inst.C.E., J. W. Meares, C.I.E., J. Swinburne, F.R.S., A. A. Campbell Swinton, F.R.S., and others. The meeting decided to hold next year's reunion on May 28th.

**Fatality.**—James Hannon (43) received a fatal electric shock on May 13th, while working at the Orgreave colliery coke ovens, near Sheffield, belonging to the United Steel Co. Artificial respiration was tried without success.

An inquest was held on May 15th. A witness said that he was supervising some work near the scene of the accident when Hannon passed him, carrying a hooked iron bar. Shortly afterwards his attention was attracted by a flash, and he saw the deceased fall to the ground. The chief electrician at the colliery explained that Hannon had to lean over a handrail in order to strike a pipe containing coke, in order to loosen the coke, and in doing so he caught the overhead trolley wire with the bar, receiving a shock at 275 V. The ground he was standing on was very conductive, being composed of damp coke breeze. The wires were bare and were 11½ ft. from the ground. A verdict of "Accidental death" was returned.

**The Export of Power from Switzerland.**—A conference of representatives of Swiss electric power stations has been held in Berne with the object of arriving at a uniform agreement with regard to the terms on which electric power is "exported" from the country. No returns for 1924 are yet available, but it was stated at the meeting that between 1920 and 1923 there was an increase of 46 per cent. in the quantity of electricity exported.

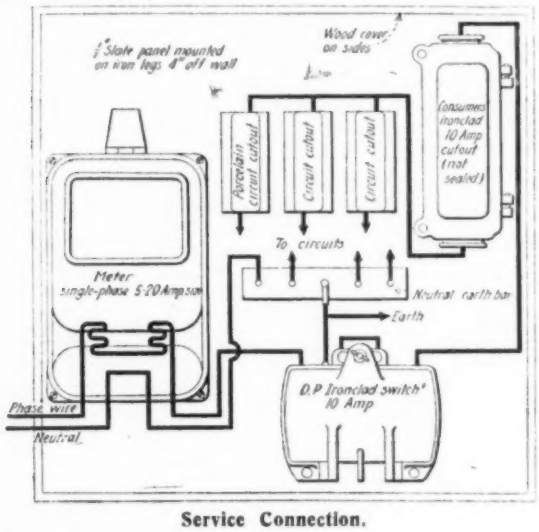
**Women's Co-operative Guild Conference.**—During the past year the Women's Co-operative Guild, which has 53,664 members and 1,164 branches, has been advocating the use of electricity in the home. Following the conferences held in various centres, the Guild will hold its annual congress at Cambridge at the end of June, when the central committee will put before the delegates a resolution to the following effect:—"Seeing that electricity is one of the greatest labour-saving forces, this congress of co-operative women demands that its benefits should be made available to the women in the home no less than the worker in the factory. In particular, it urges local authorities to make provision at reasonable cost for (*a*) the supply of electricity for domestic purposes; (*b*) the wiring of all new houses both for light and power; and (*c*) the wiring of existing houses on the deferred payment system." This resolution is the result of an inquiry which the Guild has been making during the year, and the local branches throughout the country are being urged to put the foregoing points before local authorities without delay.

**L.C.C. Tramways Finance.**—At a meeting of the London County Council on May 19th, the Highways Committee submitted a report showing that the approximate deficit on the working of the Council's tramways during the past year was £286,670. A further loss of £199,111 is anticipated during the current year, after making the reduced provision for debt redemption sanctioned by the Treasury. The report included a table showing the estimated saving to local authorities by the undertaking's contributions to rates and street widenings since 1914. The total under this head for the twelve years was given as £2,422,000, during which time the total deficit on the tramways has been £1,075,137.

The agenda for the above-mentioned meeting included a number of amendments to the resolution approving the Committee's estimates for 1925-26. These suggested the allocation of £2,500 for conducting research and experiments with a view to improving the tramcars; the issue of season tickets and the adoption of 1½d. and ½d. fares; the consideration of a tramway service to the Crystal Palace; and through-running from the Victoria Embankment to Kingston and Hampton Court, in conjunction with the London United Tramways, Ltd.

**Electricity Saves Coal.**—According to the *Daily Dispatch*, by using electricity in the kitchens a saving of 830 tons of coal a year, costing £1,037, it is estimated, will be effected at Ladywell Sanatorium. Baking and washing, potato washing and peeling, and laundry work will be done by electricity.

**Service Connection Practice in New Zealand.**—A letter from Mr. W. A. Waters, chief engineer of the Manawatu-Oroua Electric Power Board, New Zealand, to the Editor of the *Electrical World* reveals the practice in New Zealand of earthing the neutral wire at every installation, as shown in




**Service Connection.**

the accompanying diagram. All distribution of energy on new installations is on the three-phase, four-wire system, operated at 400 V for power and 230 V for lighting, and only these pressures are allowed by the Government. Mr. Waters says that the diagram illustrates practically the standard practice in New Zealand. The phase wire to consumers' services is further protected by means of a pole fuse where the service is tapped from the line.

**Aircraft Control Instrument.**—An instrument which has been constructed by the Royal Aircraft Establishment, Farnborough, registers automatically every control movement made during the most complex air manœuvres. The instrument, which is to be used for further experiments in low-speed control, comprises an electric motor, a small windmill, a film camera, an electric lamp, systems of levers and gearing with a slipping clutch, movable and fixed mirrors, and a centrifugal governor; yet the whole apparatus is less than four inches in height. It is fitted to the wing or tail planes of the aeroplane, and is connected with the aileron or elevator whose movements are to be recorded. The electric light shines on the movable mirror, which is connected through levers to the control surface. The beam of light moves as the control surface moves, and traces a line on the film, which is drawn past an aperture by the windmill-driven electric motor. Eight instruments have been made, and one has completed 15 hours' flying in 30 separate flights on an Avro machine.—*Morning Post.*

**Appointments Vacant.**—Inspector (£260) for the National Boiler and General Insurance Co., Ltd. Clerk of works and resident engineer for the Tanfield Urban District Council. Assistant telegraph engineer for the Government of the Federated Malay States. Junior technical officer (£279) for H.M.S. *Vernon*. Two junior mains assistants for the Ayrshire Electricity Board. Head of the Electrical Engineering Department of Rutherford Technical College. Clerk of Works, for the Electricity Department of the Aberdare Urban District Council. (See our advertisement pages to-day.)

**This Week's Story.** — A correspondent writes: "A customer of ours informs us that he has seen an instrument in London for testing 120 volts, 15/20 amperes, and he thinks the name on same was 'Galvenometer.' We should be pleased to know whether there is such a firm as 'Galvenometer,' and if so, their address."

**Shannon Electricity Scheme.**—The Shannon Electricity Bill passed through Committee in the Irish Free State Dail on May 15th. On the motion of President Cosgrave, the House passed a resolution authorising the payment out of the Central Fund into a separate fund of advances not exceeding the sum of £5,210,000, to defray the expenses incurred, and the charge upon the Central Fund of the principal and interest of any securities issued for the purpose of borrowing in connection with the scheme.

During the Committee stage, Major Bryan Cooper called attention to the position of existing electricity undertakings, and mentioned that the Government was seeking to sweep away monopolies upon which much money had been spent. The Government opposed, and defeated, an amendment by Professor Thrift to the effect that the contracts should be laid on the table of both Houses of Parliament and that a resolution of both Houses should be sufficient to annul them. Major Cooper pointed out that, according to the Siemens-Schuckert report, the estimate was not absolutely final, but Mr. McGilligan, Minister for Industry and Commerce, said it was, and, alluding to existing undertakings, stated that they would have to take electricity from the central power station to be established under the Shannon scheme.

The Executive Council of the Association of Chambers of Commerce of the Free State has passed a resolution urging that more time ought to be given to the consideration of the Shannon Bill, and that the agreement with Messrs. Siemens-Schuckert should be referred to a Joint Parliamentary Committee.

Cork Incorporated Chamber of Commerce has protested against the way in which the Shannon Bill is being rushed through Parliament, and against the withholding of information regarding details which ought to be at the service of the business community.

**B.E.A.M.A. Scholarships.** — Applications for the B.E.A.M.A. educational scholarships, session 1925-6, should be received not later than June 1st, and applications for renewal of scholarship, not later than July 1st. Full particulars of the scholarships may be obtained by writing to the Secretary, The B.E.A.M.A., 36, Kingsway, London, W.C.2.

**National Association of Supervising Electricians.**—W. E. HIGHFIELD SHIELD COMPETITION.—A fourth prize of £2 2s. will be awarded in this competition, on behalf of our contemporary *Electricity*.

**Barking Power Station Opened.**—The first half section of the new Barking power station of the County of London Electric Supply Company, Ltd., was ceremoniously opened by H.M. the King on Tuesday last. The station is situated on the River Thames just below Barking Creek, a favourable position for condensing water and sea-borne coal supplies, and a jetty has been constructed by the side of the station to enable ocean-going steamers of 3,000 tons to unload on the site.

The capacity of this first instalment is 120,000 kW. The station will be the largest in the country and its site covers about 100 acres.

In his address to the King at the opening ceremony, Sir Harry Renwick, K.B.E., chairman and managing director of the Supply Company, said that the portion of the station already erected, together with the main transmission system, had involved an expenditure of approximately two and a half millions.

The energy is generated at Barking at 6,600 V and the pressure raised to 33,000 V for transmission.

Many distinguished guests were present at the opening ceremony, among whom were Col. The Rt. Hon. Wilfred Ashley, Minister of Transport; Sir John Snell, Chief Electricity Commissioner; the Hon. Sir Chas. Parsons, K.C.B.; Mr. W. B. Woodhouse, President of the Institution of Electrical Engineers, and other well-known personages in the electrical world.

**Installation Repairs: A District Council's Decision.**—Some of our readers are aware that for some time past it has been contended by the Electrical Trades Union that, owing to a custom of the trade, whenever an electrician was sent out to do any kind of repair, however small, to an installation, cooking apparatus, &c., he must be accompanied by a mate. In the opinion of the Hackney Borough Council this practice was not a custom of the trade, and that such a requirement was crippling the electrical cooking industry. As a result a case has been under consideration by the Electricity Supply Industry, District Council No. 10 (Greater London Area), for several months, and it has now been decided that, "subject to reasonable interpretation it is not necessary to send out two men on these small repairs."

**The Motion of Electricity in Metals.**—In the course of his May lecture on the above subject before the Institute of Metals, in London, Prof. H. A. Lorentz, of Haarlem, following some introductory remarks regarding the constitution of atoms and the number of electrons contained in a metal and their state of motion in the atom, considered the mean velocity of the electrons when there was an electric current, and showed how Ohm's law could be understood without going into the details of the electronic motions. On the same general ground an explanation was given of Tolman and Stewart's experiments, by which it was experimentally proved that an electric current in a metal consisted in a motion of negative electrons, and the dynamical theory of electromagnetism, set forth in Maxwell's treatise, as applied to these experiments. The lecturer then discussed Drude's theory of the conductivity for electricity and for heat, and some questions connected with it, insisting on the manner in which the number of free electrons was limited by the value of the specific heat. The remaining part of the lecture was devoted to the phenomenon of super-conductivity discovered by Kamerlingh Onnes, and particularly to one of his later experiments, made with a suspended thin spherical shell of lead, in which a system of persisting parallel circular currents had been set up and which was placed in an external magnetic field whose direction did not coincide with the axis of the current system. It was shown that in these circumstances, if the electrons were absolutely free, the axis of the current system ought to have a precessional motion about the line of force passing through the centre. No trace of such a precession had, however, been observed. The conclusion was that, even in a superconductive metal, the electrons were not wholly free in their motion. It seemed as if definite paths were prescribed them, along which they could move without encountering a resistance, but which they could not freely leave sideways.

**Duplicate Bus-Bar Switchgear.**—A description is given in the *Electrical World* of an arrangement of feeder or transformer switchgear equipment for use on a double bus-bar system, resulting in certain operating facilities and a considerable reduction in installation costs. This system has been adopted by the Pacific Gas & Electric Company, San Francisco, for its 100-kV overhead transmission lines. The arrangement requires one oil circuit breaker for each feeder or transformer and an additional breaker controlling the whole bus-bar. This

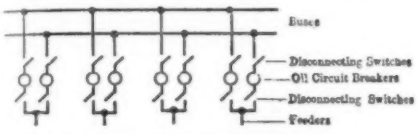



Fig. 1.—Conventional Double Bus-Bar Layout.

extra breaker is used as a paralleling switch and may be substituted for any circuit on the bars by transferring all the circuits, except the one fed by the switch to be taken out of service, to one bar and feeding the remaining circuit off the other bar through the paralleling switch. This substitution of breakers necessitates the providing of each breaker with a "by-

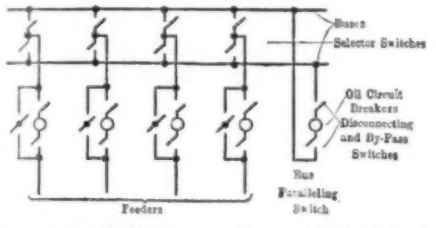



Fig. 2.—Double Bus-Bar Layout with one Oil Circuit-Breaker in each Feeder.

pass" switch as well as disconnecting switches. An outline of the arrangement is shown in fig. 1. Of course the main advantage is the saving of one oil-breaker on each feeder, as will be seen in comparing the two layouts shown in figs. 1 and 2, the additional paralleling switch and by-pass switches required being more than compensated for by this saving.

**The Efficiency of Steam Plant.**—Referring to a statement that the oil engine has an advantage over the steam engine owing to the high temperature attained in the cylinder, Sir Charles Parsons wrote to *The Times* last week pointing out that the temperature of the gases leaving the cylinder was also high—about 400 deg. C.—and that from 16 to 20 per cent. of the total heat was lost to the jacket at high temperatures, whereas the steam engine received heat at about 250 deg. C. and rejected it at about 27 deg. C. He claimed that thermal efficiencies were now being attained in some large power stations equal to that reached by any Diesel engine and electric generator, and at far less capital cost and cost of upkeep. Moreover, Sir Charles stated that much higher temperatures and pressures, made possible by the use of alloy steels, were being advocated and, if successful, would place the steam engine in a still higher position as regarded economy of fuel.

## Institution Notes.

**Institution of Electrical Engineers.**—WIRELESS SECTION COMMITTEE.—The following have been nominated by the Wireless Section Committee to serve on the Committee from October 1st, 1925:—Chairman, Major B. Binyon, O.B.E., B.Sc.; Ordinary Members, Messrs. P. R. Coursey, E. H. Shaughnessy, O.B.E., and L. B. Turner, M.A., and Captain H. J. Round, M.C.

NORTH-WESTERN CENTRE.—The report of the Committee for the past year shows that eleven meetings were held, and were well attended. The summer meeting was very successful, and popular lectures by Prof. W. L. Bragg and Prof. G. W. O. Howe drew audiences of 450 and 650 respectively. The smoking concert and the annual dinner were well supported, there being 221 guests and members present at the latter, a new record. The membership shows a net increase from 1,023 to 1,069. The chairman for the next session is Mr. A. G. Ellis; vice-chairmen, Messrs. W. J. Medlyn and H. A. Ratcliff; hon. secretary, Mr. A. L. Lunn. Acknowledgment is made of the great services rendered to the Centre by Mr. A. B. Mallinson as hon. secretary during his three years of office.

The Students' Section Committee reports an exceptionally successful session, during which 10 meetings have been held and three visits have taken place. The average attendance was higher than in any previous year. Mr. J. E. Gamage is chairman, Mr. C. Filmer vice-chairman, and Mr. L. J. H. Haylor hon. secretary for the new session.

**Institution of Civil Engineers.**—At the annual general meeting, held on May 12th, the result of the ballot for the election of Council was declared. The President-elect is Sir William H. Ellis, G.B.E., D.Eng. The vice-presidents are, Mr. Frederick Palmer, C.I.E.; Sir Archibald Denny, Bart.; Mr. E. F. C. Trench, C.B.E.; and Capt. M. H. P. Riall Sankey, C.B., C.B.E., R.E. (ret.).

**Junior Institution of Engineers.** — On Wednesday last week the annual dinner of the Institution was held at the Café Monico, London. The President, Dr. Alexander Russell, F.R.S., occupied the chair, and there was a large attendance of members and guests. Mr. J. S. Highfield, president-elect, proposed "The Institution," and Mr. H. J. Edgar, chairman, responded. "Electrical Engineers" was a toast proposed by Mr. A. P. M. Fleming, C.B.E., president of the N.W. Local Section, to which Dr. Russell responded. Mr. L. M. Jockel (vice-chairman), proposed "Our Guests," and Air Vice-Marshal Sir W. Sefton Brancker, K.C.B., and Sir Charles L. Morgan, C.B.E., responded. Finally, Mr. H. Hall (president N.E. Local Section), proposed the health of the Chairman, who briefly responded. An excellent entertainment was provided, and the function was very enjoyable.

**Royal Institution.**—On June 12th, the centenary of Faraday's discovery of benzene will be celebrated by a lecture on "Faraday as a Chemist," to be delivered by Sir William Pope. Benzene is the most remarkable compound known to chemistry, and has been the subject of incessant research, resulting in innumerable products of the utmost value to mankind.

## Our Personal Column.

*The Editors invite electrical men, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.*

Mr. ARCHIBALD PAGE, having been asked to become a director and general manager of the County of London Electric Supply Co. Ltd., has decided to join the board of that company. As a consequence he has tendered his resignation as a member of the Electricity Commission. The Minister of Transport has invited Mr. S. L. PEARCE, C.B.E., to become Electricity Commissioner; and subject to the agreement of the Manchester Corporation to release him from his present office, Mr. Pearce has signified his willingness to accept a Commissionership.

Mr. C. W. BUFTON, chief inspector of the Telephone Engineering Department at Canterbury, who has left to become assistant sectional engineer at Exeter, has been presented by his colleagues with an inscribed watch with a set of silver tea spoons for his wife.

Grays Urban Council has increased the salary of the electrical superintendent, Mr. E. GRIME, by £25 per annum.

At the Royal Automobile Club recently a silver salver was presented to Mr. WILLIAM PETO, of Peto & Radford, Ltd., by his colleagues on the Accessories and Components Manufacturers' Committee of the Society of Motor Manufacturers and Traders, of which he was chairman from 1921-25.

It is stated that Sir PETER RYLANDS has been appointed a member of the Balfour Committee on Industry and Trade in place of Mr. P. J. PYBUS, who resigned some time ago owing, says a financial daily, first to illness and then to business commitments which took him abroad.

Following the resignation of Mr. BRAID as chief engineer of the Glasgow Corporation Tramways Department, the Tramways Committee has approved the appointments of Mr. J. MACDONALD, who has had 24 years' service, and whose present salary is £700 per annum, to take charge of the engineering (electrical) department, Mr. A. GERRARD, engineering (mechanical), Mr. J. GRIERSON, engineering (civil), and Mr. G. B. MASTERTON, engineering (constructional).

Mr. K. S. MURRAY, M.I.Mech.E., who has been for many years the managing director of the British Oxygen Co., has been elected to the chairmanship of that company rendered vacant by the death of Mr. E. B. Ellice Clark. Mr. Murray will for the present continue also to discharge the duties of managing director.

On May 15th Mr. J. H. BENTLEY, who recently retired from the service of the Bradford Corporation, after having been a committee clerk for 25 years, was presented by the Electricity Committee with a resolution on vellum in recognition of his services.

Hammersmith Borough Council Establishment Committee recommends that Mr. J. JESSOP, engineer-in-charge at the Council's Electricity Works, be appointed one of the senior engineers-in-charge at a salary of £408. The Electricity Committee has appointed Mr. J. BROCKLEBANK, of Otley, assistant mains engineer, at £377 per annum, and Mr. G. A. TOTTMAN, of Blythe Road, W., fourth engineer-in-charge, at £349 per annum. Sixty-three and 61 applications respectively were received for the above-mentioned appointments.

Mr. H. J. WARD, who has been elected President of the British Engineers' Association in succession to Sir Ernest W. Petter, is chairman of Messrs. J. & E. Hall, Ltd., the well-known refrigeration engineers, of Dartford, Kent. He joined that company as a director in 1901, having previously spent nearly seven years on the staff of Messrs. Elder, Dempster and Company, Liverpool, whose Construction Department he organised and developed during a period of great expansion of the fleets under their management, having at one time the

supervision of twenty-five vessels under construction at shipyards in Great Britain and Ireland. Among these were the first four steamers of the Imperial Direct West Indian Mail Service, established to perform the contract made by the late Sir Alfred Jones (then Mr. Jones) with the Colonial Office under Mr. Joseph Chamberlain, and fitted with refrigerating installations for the transport of bananas from Jamaica. Mr. Ward has taken a leading part in the technical development of this very important branch of marine refrigeration and a great deal of the refrigerating equipment has been supplied by his firm under his personal direction. Mr. Ward's engineering training was begun as an undergraduate of Pembroke College, Cambridge, where he was fortunate in coming under Professor (now Sir) J. A. Ewing, afterwards Director of Naval Education and now Principal of Edinburgh University. This was followed by a pupilage of four years at Messrs. Harland and Wolff's, Ltd., Belfast, during which he passed through

*Hugh Cecil* [London.

**Mr. H. J. Ward.**

THE NEW PRESIDENT OF THE BRITISH ENGINEERS' ASSOCIATION.

various departments of the shipyard and engine works, including the commercial office. He is a Master of Arts of Cambridge University, Member of the Institution of Naval Architects and of the Institute of Marine Engineers.

Mr. WILLIAM CHAMBERLAIN, tramways manager and engineer at Oldham, who is leaving to take up a similar position at Leeds, has been presented by the employés with a solid mahogany roll-top desk, together with a Wedgwood salad bowl and servers for his wife.

**Obituary.**—MR. JOHN SAMPSON.—We regret to record the death, which occurred on May 11th, of Mr. John Sampson, C.B.E., M.Inst.C.E., a director of the English Electric Co., Ltd. The chairman of the company, in referring to his loss, said that to the company it was "great and unexpected." Before the English Electric Co. was formed, he said, Mr. Sampson was for many years on the board of Dick, Kerr and Co., and "his influence on these and other great concerns with which he was associated, was as profound as it was unostentatious."

MR. W. C. BUSHBY.—The death took place on May 3rd, at Winchester, of Mr. William Charles Bushby. Deceased, who was 59 years of age, went to Winchester from London in 1900 and took up an appointment in the works of the Electric Light Company. He subsequently commenced in business for himself. About a year ago he was appointed electrician at Winchester College.

MR. S. H. PEARSON.—The death occurred on April 9th, following an operation and after only a few days' illness, of Señor Samuel Hale Pearson. The *Review of the River Plate* refers to him as one of the best of Argentina's sons. He collaborated in some of the most important financial and business enterprises in the Republic, and was president of the Local Board of the Anglo-Argentine Tramways Co., of the Compañia Argentina de Electricidad and of the Local Committee of the Compañia Hispano Argentina de Electricidad.

MR. S. J. STEER.—The death took place suddenly, on May 14th, at the age of 56 years, of Mr. Sidney John Steer, who had for some years been electrical engineer at the paper mills of Reed & Co., Maidstone.

# New Companies Registered.

**East Anglian Electric Supply Co., Ltd.** (205,943).—Registered as a public company on May 13th with a nominal capital of £100,000 in £1 shares (40,000 7 per cent. cumulative preference and 60,000 ordinary). Objects: To acquire and develop the business carried on by East Anglian Electricity, Ltd.; to adopt an agreement with the said company and its liquidator, and to carry on the business of suppliers of electric light, heat and power in any part of the United Kingdom, manufacturers, constructors, suppliers, letters or sellers of any installations, apparatus, articles or mains used or employed in connection with the supply of electric light, heat and power, &c. The purchase consideration is £39,662, payable as to £500 in cash, £19,162 in shares, and £20,000 in second mortgage debentures. The directors are:—Lt.-Col. H. W. Woodall, C.I.E., Stinsford House, Dorchester; W. R. Bradbrook, Raydon, Beach Road East, Felixstowe, jeweller; C. R. Freeman, Grianon, Beach Road East, Felixstowe, insurance company's manager; V. M. Goodall, Scotland Place, Stoke-by-Nayland, near Colchester, landowner and merchant. Qualification, 100 ordinary shares. Remuneration, £100 each per annum (chairman, £150) and a percentage of the profits divided between them. Lt.-Col. Woodall is the holder of £18,750 of the first mortgage redeemable debentures and 100 ordinary shares of £1 each in East Anglian Electricity, Ltd., in respect of which he will be entitled to £18,750 second mortgage debentures and 33 ordinary shares of £1 each, fully paid. He will also be entitled to an option, exercisable at any time whilst he holds any of the said second debentures of the company, to subscribe at par for all or any of the shares in the original capital of the company which are not for the time being issued or agreed to be or reserved for issue in exchange for second debentures of the company in the event of the holders of the outstanding second debentures exercising their options of exchanging such debentures for ordinary shares, such option being in substitution for the options at present held by him to subscribe for shares in East Anglian Electricity, Ltd. W. R. Bradbrook is the holder of 575, C. R. Freeman 1,157, and V. M. Goodall 1,606 ordinary shares of £1 each in East Anglian Electricity, Ltd., in respect of which they shall be respectively entitled to 191, 385 and 335 ordinary shares, fully paid. Secretary: C. F. Dawes. Solicitors: Linklaters & Paines, 2, Bond Court, E.C.4, and Steward, Rouse, Vulliamy & Son, 17, Arcade Street, Ipswich. Registered office: 30, The Broadway, Orwell Road, Felixstowe.

**Ferrowatt Electric Lamp Works (Great Britain), Ltd.** (205,830).—Private company. Registered May 9th. Capital, £100 in £1 shares. Objects: To carry on the business of importers, exporters and manufacturers of electric lamps, all kinds of machines and machinery, tool makers, brassfounders, metal workers, &c. The subscribers (each with five shares) are:—S. Schweitzer, Sentinel House, Southampton Row, W.C.1, manufacturer; W. F. Mason, 37, Leinster Gardens, W.2, engineer. S. Schweitzer is the first permanent director. Qualification, 5 shares. Solicitor: O. B. Thomas, 59, Chancery Lane, W.C.2. Registered office: Sentinel House, Southampton Row, W.C.1.

**Shipshape, Ltd.** (205,763).—Private company. Registered May 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers, factors and vendors of and dealers in wireless and electrical apparatus, &c. The subscribers (each with one share) are:—W. Thurlby, Gore Hotel, 189, Queen's Gate, S.W.7, electrical engineer; H. Gordon, 21, Mansion House Chambers, 11, Queen Victoria Street, E.C.4, managing clerk. The first directors are to be appointed by the subscribers. Remuneration, £52 each per annum. Solicitors: George H. Olley & Co., 11, Queen Victoria Street, E.C.4.

**Electro-Plant, Ltd.** (205,926).—Private company. Registered May 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and merchants of electrical, steam and other power plant and any other kind of machinery, electrical and mechanical engineers, &c. The subscribers (each with one share) are:—A. Butterfield, 7, George Street, Hipperholme, secretary; T. Haley, 9, Sunbridge Road, Bradford, solicitor. A. Butterfield signs document as managing director. Qualification, £50 shares. Remuneration, £100 per annum, divided between them. Solicitors: Moore and Shepherd, Bradford.

**Milldale, Ltd.** (205,936).—Private company. Registered May 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, exporters, importers and factors of and dealers in wireless, electrical, oil lighting, heating and power goods, &c. The directors are:—T. T. R. Oxendale, 194, Brecknock Road, N.19, merchant; H. B. Palmer, 4, Lyndhurst Gardens, Church End, Finchley, N.3, bank clerk; H. Stursberg, Priory Side, Rochford Road, Prittlewell, Essex, merchant; A. Crawford, 3, Rosborough Avenue, Harrow (director of Peninsular Trading Co., Ltd.). Qualification, £5. Secretary: A. Crawford. Registered office: 9, Roscoe Street, Bunhill Row, E.C.1.

**Atkins & Wallis, Ltd.** (205,876).—Private company. Registered May 11th. Capital, £1,500 in £1 shares (500 preference and 1,000 ordinary). Objects: To carry on the business of electrical or wireless engineers, manufacturers and repairers of and dealers in electrical, magnetic or galvanic sets, &c. The directors are:—D. H. D. Freeman, 8, Gardner Mansions, Church Row, Hampstead, N.W.; W. Scott, 7, Manor Row, Westcliff-on-Sea. D. H. D. Freeman shall be permanent so long as he and his father, or either of them, hold 250 shares. Qualification of directors, 10 ordinary shares. Remuneration as fixed by the company. Secretary: D. H. D. Freeman. Solicitors: W. Scott, Jamaica Buildings, St. Michael's Alley, Cornhill, E.C.3.

**Bonnard Carbon Manufacturing Co., Ltd.** (205,971).—Private company. Registered May 13th. Capital, £25,300 in 25,000 ordinary shares of £1 each and 6,000 deferred shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in carbons and carbon substances of all kinds, to acquire and operate mechanical retorts or furnaces for the purposes of any such businesses, and to adopt an agreement with L. H. Bonnard and A. H. Bonnard, and to carry on business as chemists, makers of electrical and photographic apparatus, &c. The subscribers (each with one ordinary share) are:—W. L. Waites, 28, Wallingford Avenue, North Kensington, W.10, clerk; H. James, 1, Pier View Terrace, Southend-on-Sea, solicitor's clerk. The first directors are to be appointed by the subscribers. Qualification, 200 shares. Remuneration, £50 each per annum and a percentage of the profits. Solicitors: Nicholson, Graham & Jones, 19-21, Moorgate, E.C.2.

**ElectriCITY Services, Ltd.** (205,925).—Private company. Registered May 13th. Capital, £5,000 in £1 shares. Objects: To acquire a portion of the undertaking and assets of Electrical Installations, Ltd., and to carry on the business of electricians, electrical and mechanical engineers, manufacturers of and dealers in plant, machinery, apparatus and appliances used in connection with the employment of electricity, &c. It is intended to enter into a working arrangement with Electrical Installations, Ltd. The subscribers (each with one share) are:—P. J. Gordon, 18, Austin Friars, E.C.2, solicitor; A. Stanton, 18, Austin Friars, E.C.2, secretary; H. F. Simon is the first chairman and managing director. The first directors of this company or a majority of them will or may be directors and shareholders of Electrical Installations, Ltd. Remuneration, £50 each per annum. Solicitors: Slaughter & May, 18, Austin Friars, E.C.

**Radio Cabinets, Ltd.** (205,963).—Private company. Registered May 14th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wooden cabinets or wooden and cardboard boxes and articles of wood, and all kinds of necessaries for wireless telegraphy and telephony, complete wireless and electrical installations, gramophones and other musical instruments, &c. The subscribers (each with one share) are:—Arthur de Frece, 153, Abbey Road, West Hampstead, N.W., advertising agent; Miss E. M. Penty, 64, Mildenhall Road, Clapton, E.5, clerk. The first directors are to be appointed by the subscribers. Qualification, 1 share. Solicitors: A. de Frece & Co., 39, Gutter Lane, E.C. Registered office: 12, Whitehorse Yard, Essex Street, Islington, N.

**Carmichael & Partners, Ltd.** (205,855).—Private company. Registered May 11th. Capital, £500 in £1 shares. Objects: To carry on the business of consulting, electrical, mechanical, civil, constructional and general engineers, manufacturers of, agents for and dealers in plant, machinery, engines, apparatus, implements and tools, metal workers, &c. The directors are:—E. Smith, A.M.I.Mech.E., "Fairmount," Brockley View, Forest Hill, S.E.23; W. G. Bayman, Fitzalan House, Arundel Street, Strand, W.C.2. Remuneration (except managing director) as fixed by the company. Secretary: W. G. Bayman. Solicitors: Jenkinson, Meyler & Co., 5, Frederick Place, Old Jewry, E.C.2. Registered office: Fitzalan House, Arundel Street, Strand, W.C.2.

**Gordons (Thornton Heath), Ltd.** (205,930). — Private company. Registered May 13th. Capital, £3,000 in 2,000 "A" shares of £1 each and 5,000 "B" shares of 4s. each. Objects: To acquire the business of a manufacturer, wholesaler and retailer of confectionery and chocolates carried on by W. C. Gordon at 113, High Street, Thornton Heath, and at 67, Stroud Green Road, N., and also the business of a manufacturer of and dealer in wireless apparatus carried on by the said W. C. Gordon as the "W.G. Wireless Engineering Co." at 5, Railway Approach, Thornton Heath. The directors are:—W. C. Gordon (permanent director and chairman), 113, High Street, Thornton Heath; Mrs. Ivy A. Gordon, 113, High Street, Thornton Heath. Qualification, £200 shares. Remuneration of W. C. Gordon, £416 per annum; of other directors as fixed by the company. Solicitor: T. H. Godwin, 14, Coleman Street, E.C.

**G. H. Stevens & Co., Ltd.** (205,861).—Private company. Registered May 11th. Capital, £600 in £1 shares. Objects: To carry on business as electrical engineers and contractors, &c. The first directors are:—G. H. Stevens, 108, Fenchurch Street, E.C., electrical engineer; C. R. Sparrow, 45, Melody Road, Wandsworth, S.W.18, electrical engineer. Qualification, £1. Remuneration of first directors, £260 per annum; of other directors, £5 each per annum. Registered office: 108, Fenchurch Street, E.C.

**Arthur Marriott, Ltd.** (205,920).—Private company. Registered May 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, manufacturers, and suppliers of wireless, telegraphic, telephonic, magnetic and radioactive apparatus, &c. The directors are:—A. H. Marriott, 2, Bampton Street, Loughborough; J. E. Schofield, 24, Bedford Street, Loughborough; A. Tucker, "Gyseburne," Ashby Road, Loughborough; C. H. Tuckwood, 33, York Road, Loughborough. Qualification, £50 shares. Secretary: C. H. Tuckwood. Solicitors: W. Moss, 80/81, Wood Gate, Loughborough. Registered office: 3, Leicester Road, Loughborough.

# Official Returns of Electrical Companies.

**Adams Bros. (Longton), Ltd.** (Old Company).—W. H. Lawton, of 74, Church Street, Fenton, Stoke-on-Trent, ceased to act as receiver or manager on February 14th, 1925. (Notice filed May 6th, 1925.)

**Headphones (Manchester), Ltd.**—B. J. Firkins, of 279, Deansgate, Manchester, ceased to act as receiver or manager on April 30th, 1925.

**Elba, Ltd.**—J. Chapman, of 46, King's Road, Chelsea, S.W.3, was appointed receiver and manager on April 28th, 1925, under powers contained in first mortgage debenture dated December 5th, 1924.

**Sennybridge Electric Supply Co., Ltd.** (174,920).—Return dated June 30th, 1924 (filed April 18th, 1925). Capital, £1,500 in £25 shares. 48 shares taken up. £1,200 paid. Mortgages and charges, nil.

**Victoria Electrical (Manchester), Ltd.** (175,145).—Return dated December 31st, 1924 (filed February 11th, 1925). Capital, £6,000 in £1 shares. All shares taken up. £5,000 paid. £1,000 considered as paid. Mortgages and charges, £2,464 11s. 7d.

**Price's Electrical Supplies, Ltd.** (175,260).—Return dated November 7th, 1924. Capital, £3,000 in £1 shares. 1,210 shares taken up. £1,210 paid. Mortgages and charges, nil.

**Power and Lighting Supplies Co., Ltd.** (174,477).—Return dated February 10th, 1925. Capital, £5,000 in £1 shares. 2,125 shares taken up. £500 paid. £1,625 considered as paid. Mortgages and charges, nil.

**Sussex Electricity Supply Co., Ltd.** (175,686).—Return dated December 30th, 1924. Capital, £20,000 in £1 shares. 18,000 shares taken up. £18,000 paid. Mortgages and charges, £10,000.

**Hall Telephone Accessories, Ltd.** (175,783).—Return dated January 1st, 1925. Capital, £30,000 in £1 shares. All shares taken up. £1 per share called up on 2 and 10s. per share on 12,998 shares. £6,501 paid. £17,000 considered as paid on 17,000 shares. Mortgages and charges, nil.

**Jeary Electrical Co., Ltd.** (175,830).—Return dated November 25th, 1924. Capital, £15,000 in 12,000 cumulative preference and 3,000 ordinary shares of £1 each. 7,000 cumulative preference and 3,000 ordinary shares taken up. £7,000 paid. £3,000 considered as paid. Mortgages and charges, nil.

**Brookhirst Switchgear, Ltd.** (175,995). — Return dated December 31st, 1924. Capital, £550,000 in £1 shares. 126,002 shares taken up. £30,502 paid. £95,500 considered as paid. Mortgages and charges, £25,000.

**Wilson Hartnell & Co., Ltd.**—Satisfaction in full (a) on April 6th, 1925, of two debentures dated December 22nd, 1902, securing £2,500; and (b) of same date of deposit of deeds on November 14th, 1920, securing all moneys due or to become due from the company to the Union Bank of Manchester, Ltd.

**J. Stocken & Sons, Ltd.**—Particulars filed of £2,000 debentures and a bonus of 5 per cent. authorised May 4th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,500.

**Plessey Company (1925), Ltd.** — Mortgage on certain land and premises at Vicarage Lane, Ilford, dated May 4th, 1925, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £7,000.

**Grierson, Ltd.** (180,410).—Return dated December 2nd, 1924. Capital, £10,000 in 6,000 ordinary and 4,000 preference shares of £1 each. 2,501 ordinary shares taken up. £2,501 paid. Mortgages and charges, nil.

**Bordesley Electrical Accessories Co., Ltd.** (176,962).—Return dated November 21st, 1924 (filed April 24th, 1925). Capital, £5,000 in £1 shares. 4,662 shares taken up. £2,350 paid. £2,312 considered as paid. Mortgages and charges, £500.

**British Automatic Telephone Installation Co., Ltd.** (176,068).—Return dated December 14th, 1924. Capital, £10,000 in £1 shares. 4,000 shares taken up. £1 per share called up on 4,175 and 15s. per share on 325 shares. £4,418 15s. paid. Mortgages and charges, nil.

**Davis Electrical Co., Ltd.** (177,301).—Return dated December 31st, 1924. Capital, £1,000 in £1 shares. 677 shares taken up. £377 paid. £300 considered as paid. Mortgages and charges, nil.

**Artic Fuse and Electrical Manufacturing Co., Ltd.** (176,834).—Return dated December 31st, 1924 (filed February 13th, 1925). Capital, £5,000 in 4,700 ordinary and 100 deferred ordinary shares of £1 each and 4,000 founders' shares of 1s. each. 2,128 ordinary, 100 deferred ordinary, and 1,678 founders' shares taken up. £1,761 18s. paid on 1,678 ordinary and 1,678 founders' shares. £350 considered as paid on 450 ordinary and 100 deferred ordinary shares. Mortgages and charges, nil.

**Electric and Railway Finance Corporation, Ltd.** (178,213).—Return dated February 26th, 1925. Capital, £500,000 in £1 shares. All shares taken up. 1s. per share called up. £25,000 paid. Mortgages and charges, nil.

**Symondsbury Electric Lighting Co., Ltd.** (177,885).—Return dated December 31st, 1924. Capital, £2,000 in £5 shares. 210 shares taken up. £1,050 paid. Mortgages and charges, nil.

**Shoreham and District Electric Lighting and Power Co., Ltd.** (176,995).—Return dated December 31st, 1924. Capital, £27,500 in £1 shares. 7,329 shares taken up. £829 paid. £6,500 considered as paid. Mortgages and charges, nil.

# City Notes.

**Brush Electrical Engineering Co., Ltd.**

The annual meeting was held on May 11th, when Mr. E. Garcke, chairman, presided. The chairman, in moving the adoption of the report and accounts (*vide* ELEC. REV., May 8th, p. 746), said that the general industrial position in this country in relation to the question of foreign competition was particularly anxious at the present time, and as the company was again able to pay a dividend of 10 per cent., he thought it necessary at the outset to say that the circumstances of the company were not quite as good as they might appear at first sight. Internally they were all right as regarded organisation, quality of work done, and economy and efficiency of production, but externally they were exposed to many difficulties and some dangers. The rolling stock department had been fully employed during the past year, and the prospect for the present year was encouraging. Contracts had been executed or were in hand for many of the important municipal corporations and companies for the latest types of tramcars, trolley vehicles, or petrol omnibus bodies. Competition in the rolling stock business was excessively keen and the prices obtained yielded only a small margin of profit. The transformer department showed considerable progress during the year in orders of increasing importance for both home and abroad. The development of bulk supply of electricity necessarily involved a large demand for transformers, and although the number of manufacturers had increased, they had been able to secure a fair share of the work. The prospects for the present year were reassuring. The export market had difficulties of its own, of a character different from those at home, and the company was applying itself to meet these difficulties by way of special designs adapted to the particular needs and circumstances of each country. It was in the Brush-Ljüngstrom turbo-generator department that they were confronted with the chief difficulty, which was that they were manufacturing and selling an exceedingly efficient and in every way satisfactory machine which was regarded with great favour by intending customers, but owing to foreign competition and, consequently, increased home competition, the prices obtainable were so low as to make it doubtful whether the business was worth while. He had mentioned last year that the company had set its face against selling these machines at ruinous prices, but that had necessarily had the consequence of their refusing some orders which could have been taken at very low prices. The efficiency of the plant had received official endorsement in the reports issued by the Electricity Commissioners. Moreover, inquiries for the machines of all sizes had never been more numerous than during the past year and at present. It was inevitable that in the home market a proportion of the business obtainable must be for the larger sizes, and they were taking steps to meet that demand to a moderate extent. But it need not be thought that the small station had by any means ceased to be an important factor in electricity supply. Owing to the high efficiency obtainable for small sets of the Ljüngstrom type, it was still possible to generate in comparatively small stations at a cost of generation lower than that obtainable by a bulk supply from a larger station, after allowance had been made for cost of transmission. It might seem strange that being in the market with such excellent apparatus they should be unable to obtain prices sufficiently high to justify the acceptance of orders. Their organisation was as efficient and as economical as that of other engineering firms in the country. The real trouble must be looked for in the general industrial conditions of the country. There was no doubt that the facilities for production in this country had been increased beyond the present requirements of the home market, and foreign demand had been reduced by disastrous post-war conditions obtaining in foreign countries; but the serious thing was that while industrial conditions in the principal foreign countries were on the mend, in this country they were on the decline. We were importing more and exporting less than before and since the war, and we were more heavily taxed than other peoples in order to discharge our costs of the war. In this country we had enjoyed past prosperity and were living to some extent on our reserves, while foreign countries had had their adversity and were recovering from it. Labour and the employers had organised, and now the intermediate class in industry, represented by managers and technical members of the staff, found it neces-

sary to organise their interests so as not to be crushed between the other class interests; that was but a further evolution of hostile and wasteful competition between various class interests in industry in place of emulative effort to create and improve the good for all; it was a stage in the transition from individual to collective production. It was possible that this "third party" in industry might be helpful in bringing the two other parties together, but it depended upon whether the third party would always try to work with the other two or whether it would be first on one side and then on the other. Under present conditions we seemed to be organised more for the purpose of separating common interests and putting them in reciprocal opposition than for achievement of the common object. The best that could be hoped for was that the leaders of the trade unions and of the employers' federations would get together without further delay, not merely for the settlement of a particular strike for that was only a stepping stone to another strike or lock-out, but with a will to bring about a general and national understanding to place the relations between labour and capital on a more satisfactory basis. Returning to the accounts, Mr. Garcke said that the directors recommended the payment of the usual dividend of 10 per cent. for the past year on the share capital, because they had got the divisible profits as shown by the balance sheet, but it was only right to say that in comparison with the preceding year they had not quite earned that dividend on last year's business. They were not making any addition from revenue to the reserve fund, whereas for the year 1923 they added £23,600. From the point of view of the capital account, however, they thought that the reserve of £226,000 was ample. There was another reason why they recommended the maintenance of the 10 per cent. dividend; they considered that a business of that character should yield such a return on its capital; that a lower dividend would not be adequate. After deducting the income tax no one could say that it was an excessive dividend. On the other hand, the attempt to earn a higher rate of profit would militate against their obtaining orders. Cash and Government securities amounted to about £250,000. The amounts owing to them were about £40 000 larger than the amount of the claims upon them; and they had nearly £300,000 of goods and materials on hand and work in progress. In all respects, therefore, the financial position of the company was quite healthy. Lord Vaux of Harrowden seconded the motion. One of the shareholders said he would like the directors to consider the question of paying the dividend half-yearly in future. The chairman said they had already considered that matter, but a business of that kind which was subject to political and other circumstances was not always able to see in advance what the profits for the year would amount to, but he promised that the matter should be again considered. The resolution was carried.

**Lancashire Electric Light and Power Co., Ltd.**

The annual meeting of this company, whose report was reviewed in our last issue (p. 787), was held on May 15th. Mr. Alfred Shepherd, who presided, said in the course of his speech that there had been a notable increase in output. The plant had been augmented by a third 10,000-kW turbo-alternator, and two 6,000-kW sets were being erected in the place of the four original vertical turbines. When these were put into operation the total capacity of the Radcliffe plant would be 58,250 kW. The boiler house was also being extended. Although the company had maintained its high position as regarded thermal efficiency, the cost per kWh sold was somewhat higher owing to the increased price of coal and higher rates and taxes, as well as the purchase of a greater amount of energy from the Manchester Corporation. General extensions had been made throughout the area, including two new districts, Adlington and Golborne. The capital expenditure during the year was over £205,000. As stated in the report, it was anticipated that the Padiham station would be running by the end of June, 1926.

**English Electric Co., Ltd.**

The annual meeting was held on May 13th Sir Charles Ellis presiding. In moving the adoption of the report (*vide* our last issue, p. 787), after referring with regret to the recent death of Mr. John Sampson, one of the directors, the chairman said that there was no reason to be dissatisfied with the year's results, for although trading conditions last year were somewhat better than those of the previous year, the general level of prices still left much to be desired. The year was one of continued progress in all the branches of the business, and the volume of orders secured by the company was greater than in any year since its formation. In the home market the failure of successive Governments to carry the essential and vitally important electrical programme past the stage of good intentions caused symptoms of a lull in large-scale electrical development in the latter part of the year. With the agricultural and rural populations of the country less adequately served with electricity than in any of the great countries of Europe any such check could only be temporary. Indeed, the patience of a great mass of the population of this country in waiting for electricity supply to be made available for them deserved immediate legislative recognition. Abroad, there were few markets in which the company had been unable to find a sale for its products in world competition. They had confidence that the strong position which they had built up in the export trade could be maintained and strengthened. Turning to particular features of the year's trade, the chairman said that electric traction was again in the front of their activities. They completed during the year the electrical equipment ordered by the Great Indian Peninsula Railway for its suburban lines running out of Bombay, and that equipment was now in operation. Good progress was also made with the traction motors, rotary converters, and other material which they were manufacturing for the electrification of the South-Eastern section of the Southern Railway, and before the summer was out most of that material would be in commercial service. During the year they delivered several heavy electric locomotives to the Montreal Harbour Board and others to the Japanese Government Railways. Amongst a large number of new contracts for railway electrification material, the most important was that which was received from the South African Railways for the whole of the electrical equipment required for the electrification of the suburban lines in and around Capetown. When that order was completed the "English Electric" camshaft control, which was originated by their own designers and developed in this country, would be in operation in all of the continents. The other departments of the business had kept pace with the electric traction department. They had recently completed or had on order steam turbines and water turbines of the largest sizes, together with generators for countries so far apart as Poland, Japan, Australia, India, Canada and South Africa. The Fullagar internal combustion engine, which they had developed for land purposes, was now in commercial service all over the world, and in weight, dimensions and cost for a given output was recognised to have great advantages over competing types. The universal development of generating stations, whether steam, water, or oil driven, had necessarily brought in its train a growing demand for their standard industrial plant and apparatus. Another important part of the company's operations was performed through the Power and Traction Finance Company. That company existed for the investigation, financing and execution of comprehensive engineering schemes in which civil, mechanical and electrical work were all involved. During last year it was responsible for the promotion of the Lanarkshire Hydro-Electric Power Act, by which wide statutory powers were obtained for the development of the Falls of the Clyde. In agreement with the Clyde Valley Power Company, in whose area the falls were situated, they were now carrying out through the Power and Traction Finance Company extensive hydro-electric works. When these were completed, not only would upwards of 20,000 h.p., which for centuries had been running to waste, be available for the electrical development of the district, but a model hydro-electric installation on a large scale would have been constructed for the first time in this country entirely to British design and by British manufacturers. Another co-operative enterprise in which they were interested was the Sudan Light & Power Company, which had been formed to take over from the Sudan Government the operation of the electricity and water supply and the transport services in Khartoum and Omdurman. Important extensions were being carried out in all these services to meet the needs of the population, and they were confident that the rapid development of the natural resources of the Sudan would ensure the growth and prosperity of the new undertaking. The report was adopted.

**Potteries Electric Traction Co., Ltd.**

The total revenue for 1924 was £217,312 and the gross surplus £43,963. After deducting all charges against revenue, including £11,550 payable to the North Staffordshire Tramways Co., Ltd., and provision for depreciation and renewals, and adding £11,387 brought forward, there remains a balance of £20,272. From this are deducted debenture interest and dividend on the 5 per cent. cumulative preference shares from January 1st to February 15th, 1924, leaving £7,716 which the directors propose to carry forward. The reserve at December 31st last stood at £116,353 and the renewals fund at £46,527. Omnibus competition has become so severe that the transport of over 31 million passengers brought no profit to the shareholders. The company's own omnibus branch is being rapidly developed. The directors do not deem it desirable to recommend any further payment of dividend on the preference shares. The meeting is to be held to-day (Friday).

**Calcutta Electric Supply Corporation, Ltd.**

The directors' report for the year ended December 31st, 1924, records a net profit of £380,254, and to this are added a balance of £31,905 brought forward and £25,227 recovered excess profits duty, making £437,386. After providing for preference and interim ordinary dividends debenture service, taxation, depreciation and renewals (£107,002), &c., there remains a balance of £148,006, which it is proposed to distribute as follows:—To reserve fund, £45,000; to insurance fund, £3,000; to retiring gratuity fund, £1,000; and a final dividend of 8 per cent. actual on the ordinary shares (less tax), making 12 per cent. for the year, £66,183; leaving a balance of £32,823 to be carried forward. The amount of energy sold increased from 66,444,123 kWh to 85,268,793 kWh, and the number of houses connected from 14,522 to 16,672. The demand for energy in Calcutta continues to be satisfactory. A note in the report states that the ordinary shareholders continue to receive the relief afforded in previous years in respect of income tax and super tax paid in India. The preference dividend is free of British and Indian tax and the first mortgage debenture interest is income tax free. The capital account shows an expenditure during the year of £186,096, the largest item being mains (£110,860). The meeting was held on Wednesday last.

**Siemens Bros. and Co., Ltd.** The report for the past year records a balance at credit of the profit and loss account of £266,297 (as against £162,229). Debenture interest, &c., absorbed £67,439, preference and interim ordinary dividends £70 375, and taxation £11,218, leaving £117,265. A balance of £152,761 is brought forward and after the payment of a final dividend of 5 per cent. on the ordinary shares (making 7½ per cent. for the year), the sum of £195,027 is carried forward. The report states that the business steadily improved throughout the year, and the value of the orders in hand at its close was double that of the orders held at the beginning of the year. The prospects justify still further extensions of the buildings and plant and the work has been put in hand. Partly to provide for this 250,000 of the company's 10 per cent. cumulative preference shares have been sold. The outstanding liability to excess profits duty remains unadjusted, but the demand should be adequately met by the balance at the credit of the profit and loss account. Meeting, May 26th.

**British Thomson-Houston Co., Ltd.** The directors' report for 1924 says that the expenditure for additions to buildings and machinery amounted to £343,189, the principal expenditure being in connection with extensions to the works at Willesden. The profits for the year, after deducting all expenses and charges other than interest on debentures and loans, were £514,980, plus £210,863 brought forward, making £725,843. Interest on debentures and loans absorbs £122,595, and there is to be appropriated for depreciation, &c., £216,953, leaving £386,295. Dividends paid on preference shares at the rate of 7 per cent. per annum less income tax absorb £81,375, and a dividend on the ordinary shares at the rate of 6 per cent. per annum, less income tax, is recommended, requiring £93,000, leaving to be carried forward £211,920. Redemption of the amounts of 4½ per cent. and 7 per cent. debentures required under the Trust Deeds has been duly effected, and the proper proportion of discount, commission, &c., on the issue of 7 per cent. mortgage debenture stock, has been written off. The unliquidated balance of the cost of converting preference shares at the beginning of the year was £54,030. It was the intention to write off this cost by the amount saved each year in income tax, but as the reserve for contingencies is no longer required, £30,000 of the above balance has been written off from that reserve, and the remaining £24,030 from the profit and loss account for the year, so that the entire balance is now liquidated. In the last balance sheet the general reserve account stood at £100,000, and there was also a reserve for contingencies of £100,000. It is the opinion of the directors that the latter reserve is no longer required, therefore £30,000 has been applied to writing off the balance of the cost of converting preference shares, as above stated, and the balance of £70,000 has been transferred to the general reserve account, which, with £50,000 transferred from the profit and loss account increases the general reserve account to £220,000. Meeting, May 28th.

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**Callender's Cable & Construction Co., Ltd.**—The directors report that for the year 1924 the balance to credit of profit and loss is £321,708. We shall give the details next week. The dividend on the ordinary shares is 15 per cent., less income tax, and £462,695 is to be carried forward. Record business was done, and the profit, in spite of much competition, is regarded as satisfactory. The outstanding feature was the heavy demand for super-tension mains. The business everywhere overseas is being generally extended. In view of the rapid extension of the business, the capital resources are now inadequate, and at an extraordinary general meeting which will follow the annual meeting on May 28th resolutions will be submitted increasing the capital to £1,500,000 by the creation of 200,000 ordinary shares of £1 each.

**Stock Exchange Notices.**—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Burndept Wireless.—Seven preferred ordinary shares of £1 each, fully paid, Nos. 285,601 to 285,607.

Rotax (Motor Accessories).—253,634 8 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 253,634.

Applications have been made to the Committee to allow the following to be officially quoted:—

Aluminium Corporation.—£23,916 preference stock (seven per cent. cumulative).

Northern General Transport Co.—75,000 ordinary shares of £1 each, fully paid, Nos. 400,001 to 475,000.

Stuarts & Lloyds.—1,335,579 deferred shares of £1 each, fully paid, Nos. 2,700,001 to 4,035,579.

Automatic Telephone Manufacturing.—140,000 ordinary shares of £1 each, fully paid, Nos. 360,000 to 500,000.

London Electric Railway.—£365,000 consolidated ordinary stock.

**Cawnpore Electric Supply Corporation, Ltd.**—The gross surplus for 1924 was £53,966, and the deduction of debenture interest leaves a balance of £40,822, to which is added £2 167 brought forward, making £42,989. The preference and interim ordinary dividends absorbed £16,000; £8,000 is transferred to depreciation and renewals reserve; £2,280 to general reserve; £3,700 is written off the expenses of the new share issue; a final dividend of 7 per cent. is being paid on the ordinary shares (making 10 per cent. for the year); and a balance of £1,248 is carried forward. The net capital expenditure during the year was £30,063, the largest item being machinery (£19,997). A total of 13,273,091 kWh was sold during the year. Meeting: May 25th.

**Sir W. G. Armstrong, Whitworth & Co., Ltd.** — The report for the past year shows a balance, after meeting note and debenture interest, of £505,250, and the addition of £679,768 brought forward gives £1,185,018. The dividends (including a total of 5 per cent. on the ordinary shares) absorbed £528,125 and the balance (£656,893) is carried forward. Owing to keen foreign competition, due principally to the low wages paid on the Continent, it has been difficult to obtain orders at remunerative prices. The company has accepted many orders showing only a small margin of profit with the object of spreading the heavy overhead charges over a greater volume of work.

**General Electric Co. (U.S.A.).**—Orders to the value of $283,107,697 were received by the company during last year, and the actual sales amounted to $299,251,869. The net income from sales was $34,342,230, as compared with $29,655,746 in 1923, and the total amount available was $45,135,683 ($38,001 528). Dividends of 6 per cent. on special stock and of 8 per cent. on common stock were paid, and a surplus of $23,638,162 is carried forward.

**Bideford and District Electric Supply Co., Ltd.**—At the recent annual meeting it was reported that the number of consumers had increased, and that the total receipts on revenue account amounted to £2,413. It was also pointed out that if sufficient financial support was forthcoming, the company would extend the supply to Torrington, Wear Gifford and Instow. A dividend of 7 per cent. was paid on the preference shares and 2½ per cent. on the ordinary shares.

**Craigpark Electric Cable Co., Ltd.**—At the annual meeting in Glasgow on May 14th, Dr. Magnus Maclean said that prices of raw material for the last year had been rather high, and the competition for their finished products had been more than usually keen. Under those circumstances the directors were pleased to be able to recommend a dividend of 10 per cent. on the ordinary shares. They had also added a considerable sum to their surplus fund.

**Alderley and Wilmslow Electric Supply, Ltd.**—The report for the past year, which was submitted at the annual meeting on April 28th, showed a net revenue (including £652 brought forward) of £2,839. Of this balance £600 was transferred to general reserve; a dividend of 8 per cent., free of tax, was declared on the ordinary shares; and £639 is carried forward. A sum of £5,552 was spent on capital account during the year, principally on buildings and machinery.

**Greenock and Port Glasgow Tramways Co.**—The receipts during 1924 were £60,247, and after meeting expenses and setting aside £7,549 for renewals, the surplus was £6,507, plus £1,270 brought forward, making £7,777. It was proposed to transfer £1,765 to sinking fund for loan redemption and £1,822 to reserve, to pay a dividend of 5 per cent. on the preference shares and to carry forward £690.

**Rothesay Tramways Co., Ltd.**—The receipts during 1924 totalled £18,981—about £600 less than in 1923. After meeting expenses, including debenture interest and provision for renewals, and adding a balance of £1,426 brought forward, the sum of £7,124 is available. It is proposed to pay a dividend of 3 per cent. on the ordinary shares, as in 1923, to place £3,000 to reserve, and carry forward £1,171.

**Dorman, Long & Co., Ltd.**—The directors have declared a half-yearly dividend at the rate of 6 per cent. (payable June 30th) on the cumulative preference shares, but they are unable to recommend dividends on the preferred ordinary or ordinary shares.

**Reduction of Capital.**—PARSONS' FOREIGN PATENTS CO., LTD., AND REDUCED.—A petition for the confirmation of the reduction of the capital of the company from £60 600 to £45,600, has been presented to the High Court and will be heard in London on May 26th.

**Calcutta Tramways Co., Ltd.**—A final dividend of 6 per cent. actual, free of tax, has been declared upon the ordinary shares, making 10 per cent., free of tax, for the year 1924. The total dividend for 1923 was 7½ per cent.

**Shropshire, Worcestershire & Staffordshire Electric Power Co.**—The directors have declared a dividend of 8 per cent. on the "A" ordinary shares and one of 5 per cent. on the "B" ordinary shares (as against 4 per cent.) for the past year.

**British Columbia Electric Railway Co., Ltd.**—A dividend of 3½ per cent., free of tax, has been declared on both the preferred and deferred ordinary stocks in respect of the year ending June 30th next (as in 1924).

**British Electric Traction Co., Ltd.**—The directors recommend a final dividend of 5 per cent. on the ordinary stock for the year ended March 31st last, making 7 per cent. for the year, as compared with 6 per cent. for the previous year.

**Hart Accumulator Co., Ltd.**—A final dividend of 10 per cent. has been declared, making 15 per cent. for the year, as compared with 13 per cent. in 1923.

**John I. Thorneycroft & Co., Ltd.**—An interim dividend of 3 per cent. on the cumulative preference shares is announced.

**Mississippi River Power Co.**—A dividend of 1½ per cent., payable July 1st, has been declared on the preferred stock.

# Stocks and Shares.

MONDAY EVENING.

THE London Electricity Supply Bills passed their third reading last week. There was a little opposition up to the end, but the supporters of the Bills had no difficulty in carrying them, and only the Royal Assent is now required to render the Bills ready for the Statute Book. At the end of so many years of struggle, disappointment and hostility, the achievement is one regarding which those who have been engaged in the business may feel justifiable pride. The City and the West End companies alike are to be congratulated upon the tenacity with which they have stuck to their purpose.

In the former group, the efforts of Sir Harry Renwick stand out with prominence, and the triumph of the electricity supply companies comes at an appropriate moment, in that it was on Tuesday in this week that the King and Queen opened the new Barking Power Station of the County of London Electric Supply Company, in the presence of a large assembly. This Barking extension will do much to develop the provision of cheap and abundant power over an industrial area in which it should prove of the greatest value to trade. That its Royal inauguration should coincide so nearly with the date at which the Electricity Supply Bills received their third reading in the House of Commons will be regarded as a happy omen for the new conditions that now stretch ahead of London's electricity supply for nearly half a century.

County ordinary shares are 1/16 up at 2¼, and Electric Supply Corporation shares at 33s. 9d. show ¼ rise. Urbans have gone back to 17s. 6d. Newcastle-on-Tyne fell 9d. to 22s. 6d. and Londons are a little easier at 34s. 6d. Two or three new issues are expected to make their appearance in this department within the near future; and, after Whitsun, it is expected that there may be half-a-dozen offers of stock in companies connected with the electrical industry to which public subscription will be invited.

Home Railway stocks are quiet and rather disposed to dulness. Metropolitans fell 1½ to 75½, but Districts and the Underground Electric issues have not changed on the week. British Electric Tractions are 4 points better at 112½ on the raising of the dividend from 6 per cent. to 7 per cent. The increase had been partially anticipated by a recent rise in the price of the stock, and at the present rate the yield on the money comes to 6¼ per cent., allowing for the accrued dividend. The Potteries Electric Traction Company reports a surplus for last year of £44,000. A small part of the preference dividend has been paid, but the directors regret that, owing to the necessity for conserving resources, no further payment can be recommended at present in respect of the dividend on this issue. The nominal price of the preference shares is 5s., the ordinary stand at 3s. 6d., and the 4½ per cent. debenture, recently ex dividend, is quoted at 74½.

Cable stocks are disposed to be easier. Eastern ordinary has fallen to 175½ and Great Northerns to 32, a little stock having come to market in both cases. Automatic Telephones fell back to 40s. after their sustained rise. Marconi and other wireless shares are uninteresting.

English Electric shares moved up a trifle to 18s. upon the meeting which took place last week, where Sir Charles Ellis, the chairman, made a confident and an encouraging speech. Brush ordinary have fallen to 24s. 6d. and Edisons to 7s. 9d. Otherwise the list is firm. India Rubber shares keep their florin gain; and, amongst the cable construction shares, British Insulated, Callenders and Henleys are all better.

Calcutta Electric Supply shares are steady at 35s. 7½d., the company's report showing substantial progress and the dividend being raised, as already mentioned, by 1 per cent. to 12 per cent. The Calcutta Tramways Company announces a dividend of 6 per cent. actual, making 10 per cent. free of tax for the year as against 7½ per cent. in 1923. The price of the shares is better at 27s. 6d.

Babcock & Wilcox moved back to 2 9/16, the iron and steel market being still depressed, although not quite so bad as it was in the middle of last week. The feature amongst Industrials is the continuance of a boomlet in rubber shares, the price of the raw produce having risen to nearly 3s. per lb., which is nearly a shilling higher on the week. Public attention has turned to the market and the settlement to be dealt with in the current week is one of the heaviest with which rubber share dealers have been engaged for many years.

In the foreign list, Brazilian Tractions have sagged to 52½. Mexican Light Common, and the company's first mortgage bonds are better. Manila Electric Common advanced to 44½. Holders are asked to agree to the exchange of their common shares for 6½ per cent. debenture obligations of the Associated Gas & Electric Company. The setting-up again of the gold standard serves to arouse a little more interest than usual in the dollar shares and bonds of American and Canadian descriptions. The British public, however, are paying little more than academic attention, at present, to the Transatlantic stocks.

# Share List of Electrical Companies.

### HOME ELECTRICITY COMPANIES.

| | Nom. £ | Dividend. 1923. | Dividend. 1924. | Price May 18 1925. | Rise or fall. | Yield p.c. |
|---|---|---|---|---|---|---|
| Bournemouth and Poole ... | 1 | 18 | 14 | 2½ | — | 4 19 7 |
| Brompton Ordinary ... ... | 1 | 10 | 10 | 1¾ | — | *5 14 3 |
| Charing Cross Ordinary ... ... | 1 | 14½ | 15 | 45/9 | — | 6 11 2 |
| do. do. do. 4½ Pref. | 1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Chelsea ... ... ... ... | 1 | 12 | 12 | 1⅝ | — | 6 8 0 |
| City of London ... ... ... | 1 | 15 | 15 | 2⅞ | — | 6 9 10 |
| do. do. 6% Pref. ... | 1 | 6 | 6 | 23/6 | — | 5 2 2 |
| Clyde Valley ... ... ... | 1 | 8 | 8 | 32/6 | — | 4 18 6 |
| County of London ... ... ... | 1 | 15 | 15 | 2¾ | + ⅛ | 5 9 1 |
| do. do. 6% Pref. ... | 1 | 6 | 6 | 23/- | — | 5 4 4 |
| Edmundson's Ordinary ... ... | 1 | 7 | — | 23/6 | — | 5 19 0 |
| do. 7% Pref. ... ... | 1 | 6 | — | 23/- | — | 6 1 9 |
| Elec. Supply Corporation ... | | 10 | 10 | 1½ | + ¼ | 5 13 6 |
| Kensington Ordinary ... ... | 5 | 14 | 15 | 12⅜ | — ½ | 5 16 6 |
| Lancs. Light and Power ... | 1 | 7½ | 7½ | 28/- | — | 5 7 1 |
| London Electric ... ... ... | 1 | 10 | 10 | 34/6 | —6d. | 5 15 11 |
| do. do. 6% Pref. ... | 5 | 6 | 6 | 5⅞ | — | 5 6 8 |
| Metropolitan ... ... ... | 1 | 10 | 11 | 38/3 | — | 5 15 0 |
| do. 4½% Pref. ... ... | 1 | 4½ | 4½ | 17/6 | — | 5 2 10 |
| Midland Counties ... ... ... | 1 | 5½ | 6 | 24/3 | — | 4 19 0 |
| Newcastle-on-Tyne Ordinary ... | 1 | 6 | 7 | 1¼ | —9d. | 6 13 4 |
| do. 5% Pref. ... | 1 | 5 | 5 | 18/9 | — | 5 6 8 |
| do. 7% Pref. ... | 1 | 7 | 7 | 25/6 | — | 5 9 10 |
| Notting Hill 6% Pref. ... ... | 10 | 6 | 6 | 10 | — | 6 0 0 |
| North Met. Elec. 6% Pref. ... | 1 | 6 | 6 | 1¼ | — | 5 6 8 |
| St. James' and Pall Mall ... | 5 | 17½ | 17½ | 13⅜ | — | 6 8 8 |
| South London ... ... ... | 1 | 15 | 15 | 2½ | — | 6 0 0 |
| South Metropolitan Pref. ... | | 7 | 7 | 1¼ | — | 5 12 0 |
| Urban Ordinary ... ... ... | 1 | 4 | 4 | 17/6 | — ⅛ | 4 11 5 |
| do. 6% Pref. ... | 1 | 6 | 6 | 20/-xd | — | 6 17 1 |
| Westminster Ordinary ... ... | 1 | 15 | 15 | 44/6 | — | 6 14 10 |
| Whitehall Elec. Invst. 7½% Pref. | 1 | 7½ | 7½ | 19/9 | — | 7 12 0 |
| Yorkshire Elec. ... ... ... | 1 | 8 | 8 | 31/- | — | 5 3 3 |

### HOME RAILS.

| | | | | | | |
|---|---|---|---|---|---|---|
| Central London Ord. Assented | Stock | 4 | 4 | 89 | — | 5 15 11 |
| Metropolitan ... ... ... | ,, | 4 | 5 | 75½ | —1½ | 6 12 5 |
| do. District ... ... | ,, | 8½ | 8½ | 49½ | — | 7 4 4 |
| Underground Electric Ordinary | 10 | Nil | Nil | 2¾ | — | Nil |
| do. do. "A" ... | 1/- | Nil | Nil | 8/- | — | Nil |
| do. do. Income | Bonds | 6 | 6 | 97 | — | *6 3 9 |

### TELEGRAPHS AND TELEPHONES.

| | | Dividend. 1922. | Dividend. 1923. | | | |
|---|---|---|---|---|---|---|
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 105 | — | 5 14 3 |
| do. Def. ... ... | ,, | 1½ | 1½ | 24½ | + ½ | 6 3 9 |
| Automatic Telephone ... ... | 1 | Nil | 3 | 2 | — ⅛ | 3 0 0 |
| Chili Telephone ... ... ... | 5 | 6 | 6 | 5⅞ | — | *5 10 4 |
| Cuba Sub. Ord. ... ... ... | 10 | 7 | 5 | 6¾ | — | 7 5 6 |
| Eastern Extension ... ... | 10 | 10 | 10 | 17½ | — | *5 14 3 |
| Eastern Tel. Ord. ... ... | Stock | 10 | 10 | 175½ | —2 | *5 14 9 |
| Globe Tel. and T. Ord. ... ... | 10 | 10 | 10 | 18 | — | *5 11 1 |
| do. do. Pref. ... ... | 10 | 6 | 6 | 11½ | — | 5 7 10 |
| Great Northern Tel. ... ... | 10 | 24 | 22 | 32 | — ½ | 6 17 6 |
| Indo-European ... ... ... | 25 | 7 | 7 | 41½ | — | *4 4 4 |
| Marconi ... ... ... ... | 1 | 15 | 10 | 1⅛ | — | 5 19 7 |
| Marconi Marine ... ... ... | 1 | 10 | 10 | 1¼ | — | 8 17 10 |
| Oriental Telephone Ord. ... | 1 | 12 | 12 | 2⅞ | — | *5 16 3 |
| United R. Plate Tel. ... ... | 5 | 8 | 8 | 7⅛ | — | *5 13 3 |
| Western Telegraph ... ... | 10 | 10 | 10 | 17½ | — | *5 15 11 |

### HOME AND FOREIGN TRAMS, &c.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Arg. Trams First Pref. ... | 5 | 12½ | 5½ | 8½ | — | 8 9 3 |
| do. do. 2nd Pref. ... | 5 | 5½ | 6 | 9⅜ | — | 10 7 10 |
| do. do. 5% Deb. ... | Stock | 5 | 5 | 75 | — | 6 13 4 |
| British Electric Traction Ord. ... | ,, | 5 | 6 | 112½ | +4 | 5 5 0 |
| do. do. 6% Pref. ... | ,, | 6 | 6 | 107½ | — | 5 11 7 |
| Brazil Traction ... ... ... | 100 | 4 | 4 | 54 | —1 | 7 13 10 |
| Brit. Columbia Elec. Rly. Pce. | Stock | 5 | 5 | 89½ | — | 5 11 9 |
| do. do. Preferred | ,, | 5 | 90/- | 89½ | — | *5 7 3 |
| do. do. Deferred | ,, | 8 | 132/6 | 107½ | — | *6 3 6 |
| do. do. Deb. | ,, | 4½ | 4½ | 78½ | — | 5 8 3 |
| Lond. & Sub. Trac. 5% Pref. ... | 1 | 5 | 2½ | 6/6 | — | Nil |
| London United Tram. Deb. ... | Stock | 4 | 4 | 47½ | — | 8 8 5 |
| Mexico Trams, 5% Bonds ... | — | Nil | 5 | 66 | — | 7 11 6 |
| Mexican Light Common ... | 100 | Nil | Nil | 27 | +1 | Nil |
| do. Pref. ... ... | 100 | Nil | Nil | 61 | — | Nil |
| do. 1st Bonds ... | — | 5 | 5 | 67½ | + 1 | 7 6 2 |
| Yorkshire (West Riding) ... | 1 | — | 5 | 18/9 | — | 5 6 8 |

### MANUFACTURING COMPANIES.

| | | | | | | |
|---|---|---|---|---|---|---|
| Babcock & Wilcox ... ... | 1 | 20 | 12 | 2⅛ | — ⅛* | 4 15 6 |
| British Aluminium Ord. ... ... | 1 | 5 | 5 | 22/6 | — | 5 7 6 |
| British Elec. Transformer Pref. | 1 | Nil | Nil | 17/6 | — | ... ... |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 3¾ | + ¼ | 4 13 3 |
| Brush Ord. ... ... ... ... | 1 | 10 | 10 | 24/6 | — ⅛ | 8 3 4 |
| Callenders ... ... ... ... | 1 | 15 | 15 | 3½ | + ⅛ | 4 5 5 |
| do. 6½% Pref. ... ... | 1 | 6½ | 6½ | 23/9 | — | 5 9 5 |
| Crompton Ord ... ... ... | 1 | 5 | Nil | ¾ | — | ... ... |
| Edison-Swan ... ... ... | 4/- | 7½ | 10 | 7/9 | —3d. | 5 1 7 |
| do. 5% Deb. ... ... | Stock | 5 | 5 | 82½ | — ½ | 6 1 3 |
| Electric Construction ... ... | 1 | 10 | 10 | 33/9 | — | 5 15 10 |
| Enfield Cable, Pref. ... ... | 1 | 7½ | 7½ | 1¼ | — | 6 0 0 |
| English Electric ... ... ... | 1 | 8 | 5 | 18/- | +3d. | 5 11 1 |
| do. do. Pref. ... ... | 1 | 6 | 6 | 21/- | — | 5 14 3 |
| Gen. Elec. Pref. ... ... ... | 1 | 6½ | 6½ | 23/6 | — | 5 10 8 |
| do. Ord. ... ... ... | 1 | 5 | 5 | 22/9 | — | 4 7 3 |
| Henley ... ... ... ... | 1 | 15 | 15 | 3¾ | + ⅛ | 4 12 4 |
| do. 4½% Pref. ... ... ... | 5 | 4½ | 4½ | 4¼ | — | 5 6 0 |
| India-Rubber ... ... ... | 1 | 10 | 5 | 1⅜ | — | *4 8 11 |
| Johnson & Phillips ... ... | 1 | 5 | 10 | 1½ | — | 5 10 4 |
| Met-Vickers, Ord.... ... ... | 1 | 15½ | 8 | 23/9 | — | 6 14 9 |
| do. Pref.... ... ... | 2 | 8 | 8 | 2⅜ | — | 6 14 9 |
| Siemens Ord. ... ... ... | 1 | 5 | — | 37/- | — | 3 14 0 |
| Telegraph Construction ... ... | 15 | 20 | 20 | 27 | — | *4 14 1 |

* Dividends paid free of Income Tax.

# The "Repairs" Organisation—I.

## The Procedure of the Salesman with Regard to Repairs.

By W. J. HISCOX.

THE manufacturer of a working product has to introduce into his selling organisation a "repairs section," and the important bearing this has upon future business must not be lost sight of. The narrow view that the salesman has to sell, and that repairs, by prolonging the life of the commodity, have an adverse effect upon subsequent sales is not borne out by experience, for an intelligent understanding and handling of the repairs section results in increased business, and it is only when this section is neglected or abused that bad results are apparent.

Intelligent handling of repairs automatically brings into being an advisory department, for it is by this means that the measure of the customer's satisfaction is gauged, and the methods for retaining his goodwill are devised. A satisfied customer is a good advertisement, and opportunity in this direction is unlimited when constant touch with the purchaser is maintained; for the customer, feeling that he is not cast aside once the sale is effected, listens to the advice of the salesman, and is convinced of its honesty and sincerity.

Many salesmen consider that they have no direct interest in repairs, and will adopt questionable tactics to secure a further order. They will examine the apparently worn-out commodity, declare it to be beyond repair, and suggest the installation of a new machine. The customer may agree, and the salesman departs well pleased with himself, but this satisfaction is short-lived when the salesman connected with a rival concern calls upon the customer and offers to repair the machine.

The up-to-date manufacturer has a special section attached to his factory for the handling of repairs, the head of this section being responsible for the estimating, and also the carrying out of the work, in close association with the sales manager. If mechanics are attached to the district depôts, they are controlled by the head of the repair section, although of necessity they must work to the instructions of the salesman in charge of the depôt.

The association of the district salesman with repairs is very close, and yet the position is somewhat complex. In the first place, the salesman is not (as a rule) a mechanic, and he must, as a consequence, rely to some extent upon the judgment of the mechanic, although his own intelligence plays an important part. It is the mechanic who overhauls the machine and furnishes a report, but it is the salesman who makes the decision. The procedure may be summarised as follows:—

The salesman, having secured an order, sends particulars to the head office, for transmission to the factory, and in due course the unit is dispatched to the district depôt. The unit has, of course, been inspected and tested prior to dispatch, and is presumably correct to specification, and in good working order. Upon arrival at the district depôt, it is inspected by the mechanic, the necessary fixing parts drawn from stock, and the unit then conveyed to the customer's establishment, for fixing in position. When this has been accomplished, a report is drawn up and signed by the mechanic, testifying that everything is in order, and this is handed to the salesman. An alternative procedure is to dispatch the unit direct from the factory to the customer, a notification of dispatch being sent to the district depôt, upon receipt of which the mechanic is instructed to proceed to the customer's establishment for the purpose of fixing the unit.

Despite the fact that the construction of the unit is quite in order, it may be that certain minor adjustments are necessary to ensure efficient working under peculiar conditions, and particulars of these are entered upon the mechanic's report. The mechanic is expected to see that the unit is properly working before he departs, and a few days later the salesman calls to see that everything is satisfactory.

The customer receives printed instructions relating to the working of the unit, especially with regard to correct lubrication, this being most important. He is also warned as to the parts most likely to need replacement at a comparatively early date, a list of these parts, together with an intimation that they can be supplied from stock, being handed to him.

It is after this point that the question of repairs becomes a matter for consideration. Under normal conditions, the makers can determine the probable "life" of the unit, but this life is contingent upon certain renewals. The conditions under which the unit works must, however, be taken into consideration, and those conditions must be known to the salesman. The treatment accorded the unit at the hands of its purchaser is also a vital factor, for while in some cases the utmost care is taken, in others the unit is subjected to harsh treatment, being worked beyond its normal capacity, lubrication neglected, or other precautions ignored.

Periodical visits on the part of the salesman enable him to become cognizant with these points, and he makes a note of his observations. He should, in a tactful manner, draw the attention of the purchaser to any omission or abuse, for it is not good business to use these "contributory causes" to his own ends, on the assumption that the sooner the unit wears out the sooner will he get a repeat order. The customer is, in all probability, quite unaware of the fact that he himself is the cause of the trouble, and will consequently dub his purchase "inferior" and "inefficient," giving expression to this opinion to his business friends and acquaintances.

It is in this connection that the salesman interests himself in repairs. His real business is to sell new products, and he may be disposed to cavil at the time presumably wasted upon repairs, for which he gets no credit. But, be it understood, neither does he get credit for the dozen fruitless calls he makes each week in search of business, yet perforce he must make them. The time spent upon repairs is just as productive (and probably more so) and just as necessary, and he is a poor salesman who cannot see some direct result of his activity in this direction.

Repairs may be classified under three headings as being occasioned by (1) constructional defects, (2) neglect or abuse on the part of the purchaser, and (3) legitimate wear and tear. Dealing with (1), these defects, hidden for some time, become manifest after a period of working, and cannot be entirely obviated by even the most thorough system of factory inspection. In some cases, however, inspection is at fault, and then the salesman must needs exercise his ingenuity if he would placate his customer. If he is wise, he will not waste time in making lengthy explanations or excuses, with a view to shielding the factory, neither will he be too strong in his condemnation. In such a case "least said soonest mended" is the best policy, and promptitude in repairing the error will do more than anything else to restore harmonious business relations.

The precise nature of the defect having been ascertained, the matter is reported to the Head Office. If the customer is sorely displeased, this fact is also recorded, and the sales manager is determined that the works shall realise the gravity of the defect. If it is a constructional defect, such as parts working loose, &c., a complaint will ensure extra attention being paid to inspection, with a view to preventing a recurrence, but if the trouble is occasioned by a hidden flaw in the ma-

terial, it may be very difficult to guard against, no matter what precautions are taken. The salesman must be able to distinguish the avoidable from the unavoidable, and the line taken must be governed by the category in which the defect is included.

Neglect or abuse on the part of the purchaser necessitates a display of tact on the part of the salesman in dealing with a delicate situation. The purchaser considers himself the aggrieved party, and suggests that the inconvenience he is put to is sufficient payment for the repairs necessary. The salesman obviously cannot agree, and he must gently (but firmly) put the real facts of the case in front of the customer. If he has a good reputation, and has studied his customer in the past, he should be able to talk convincingly, and settle the matter with perfect good feeling. It does not pay to quarrel with the customer, but it is equally unwise to pander to him, and the position taken up should be unassailable.

The customer having been brought to reason, it is not wise to take undue advantage. The salesman may feel inclined to "get a bit of his own back" by making the case look as black as possible, and emphasising the costly nature of the repair, but this is not good policy. The customer is now at the mercy of the salesman, but resentment lingers, and this is not removed until he is convinced that the salesman is doing everything possible to help him.

The repairs classified (3) occasioned by legitimate wear and tear constitute a somewhat different proposition to the foregoing, and as these merit more detailed consideration, it is proposed to deal with them in the next article.

# Gas Turbines.

## A Review of Current Theory and Practice.

By M. KONIG, Ing.Dipl., E.T.H.Z., A.M.I.M.E.

(*Abstract of Paper read before the* NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.)

(*Concluded from page 756.*)

The paper contains details of those gas turbines which have actually been built and tested. Whilst the exhaust-gas turbine of Rateau may be considered as successfully established,

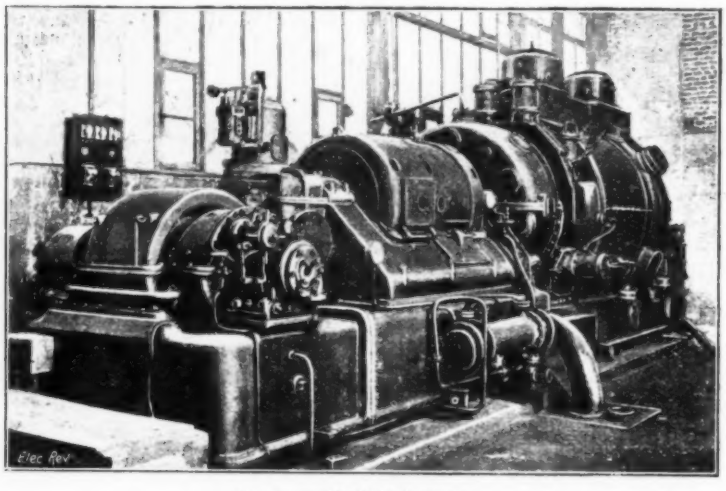


Fig. 3.—A 300-kW Oil Turbine.

there are still queries in the case of the Holzwarth machine. The two cannot be compared, Rateau's aerial turbine being a machine of only about 50 h.p., whilst Holzwarth's is approaching a commercial solution. The main features of his turbine are constant-volume combustion of a slightly pre-compressed mixtures (lately combined with short constant pressure period) in a number of explosion chambers. The whole compression work is done by a rotary compressor driven by an auxiliary steam turbine supplied from the regenerators, *i.e.*, the negative compression work is covered by the exhaust gas energy.

*Holzwarth Turbines.*—The first 50-h.p. machine built by Korting in 1908 belongs to history. The second, designed for an output of 1,000 h.p. in 1910, was tested by Brown, Boveri at Mannheim. It was of a vertical shaft design; was erected again at the Thyssen works at Mulheim, considerable alterations being made to the turbine; and tests in 1921-22 induced the Prussian State Railways to place an order with Thyssen for a 1,000-h.p. gas turbine. Test results with a 700-kW gas turbine and also a 300-kW oil turbine of May, 1923 (fig. 3) are given in the paper, the overall efficiencies of 17.8 and 16.8 per cent. being remarkable for the outputs. Considerable confidence is placed by those financially interested in these designs, as after four successive machines a fifth one of 5,000-kW output at 1,000 r.p.m. is ready for testing (figs. 4 to 6). It has a single Curtis wheel of 10 ft. diameter (weight, 12 tons); nozzle height about 4 in.; second moving blade 6 in. approximately. The pre-compression in the eight combustion chambers is about 50 lb. absolute, at a mean temperature of 200 deg. F. The ignition of the charge by two high-pressure plugs raises the pressure to about 250 lb. per sq. in. at a temperature of almost 3,000 deg. F. The nozzle valve opens rapidly to its full extent on the action of the first pressure wave. The gases expand through nozzles (in this case of the built-up type) to slightly above atmospheric pressure in the wheel-chamber. Holzwarth claims as one of the main achievements the reduction of the time interval between ignition and completed expansion down to from 0.10 to 0.20 of a second. Immediately the expansion is finished, air slightly above atmospheric pressure is scavenged through the combustion chamber, nozzle valve and wheel-chamber, maintaining in the latter a mean temperature of about 800 deg. F. After this period, which lasts about 0.8 of a second, the nozzle valve closes and gas and air valves admit a new charge within 0.5 second, a full cycle therefore lasting about 1.5 seconds. All valves are governed by pressure oil from a central distribution valve.

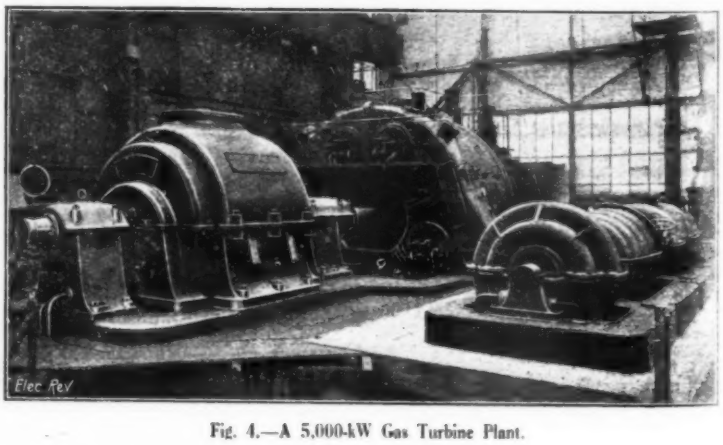


Fig. 4.—A 5,000-kW Gas Turbine Plant.

An actual blade of the Holzwarth turbine is illustrated in fig. 7. Packer, blade, and shrouding are stamped in one piece; the material is a soft electrolytic iron with a very low carbon content. The blades possess a grooved root and are inserted in a corresponding groove of the disk head and the insertion of a loose wedge piece inside the undercut blade root holds the blading tight to the rim by its centrifugal force.

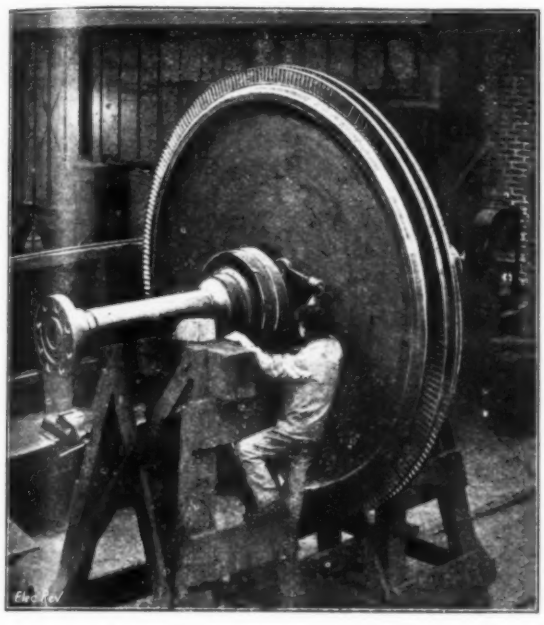

Fig. 5.—Wheel of 5,000-kW Gas Turbine.

*Aerial Rateau Turbine.*—The gas turbine has achieved success in the field of supercharging aerial engines for the purpose of maintaining the sea level output at high altitudes.

Rateau was the first to build a supercharging turbo-blower driven by the exhaust gases of the engine, having started tests in 1916. The rotor of the compressor has a total weight of 3 kg., is of tungsten steel, has a diameter of 18 cm., runs at from 25,000 to 30,000 r.p.m., and has developed about 50 h.p. from the exhaust gases of a 300-h.p. engine. The whole arrangement, including all accessories, weighs only about 80 kg. and enables the output of the main engine at high altitudes to be doubled.

Extensive tests with the Rateau principles were also carried out in the United States of America by the G.E. Co. After preliminary tests with a machine designed by Sherbondy, a revised design by Moss was tested on Pike's Peak, a mountain of 14,000 ft. altitude, in Colorado, and only after it had proved

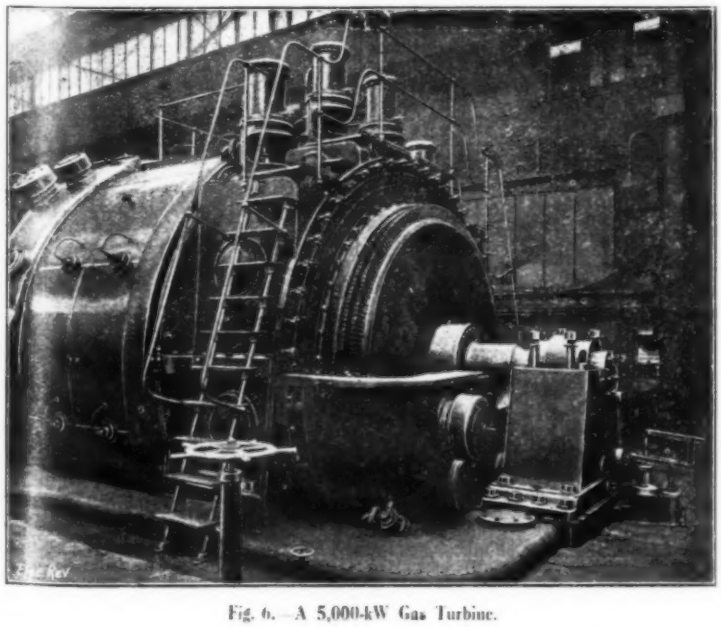

Fig. 6.—A 5,000-kW Gas Turbine.

successful was it installed in an aeroplane. It has been estimated that a 250-h.p. engine provided with a super-charger will deliver at 25,000 ft. altitude as much power as a 1,000-h.p. engine without a supercharger, being considerably lighter and having less fuel and tankage weight. In January, 1924, the G.E. Co. reported on a considerably improved supercharger running at from 33,000 to 41,000 r.p.m., feeding at 35,000 ft. with sea-level pressure. For a total weight of 140 lb. the output is thus increased by 280 h.p. (=2 h.p. per lb. extra weight).

*Turbine of Messrs. Barron, Dale & Packham.*—The author has much pleasure in referring to an English design of gas turbine at present under test, the working cycle of which is covered by the English provisional patent No. 84,883. Fig. 8 is a view of the machine as erected at Chelmsford. Preliminary trials in the early spring of 1924 resulted in a thermal efficiency of approximately 10 per cent. on a constant volume cycle, the turbine proper being of the simple impulse type, designed for about 200 kW at 10,000 r.p.m. It drives a d.c. generator through De Laval reduction gear. One of the main features is the arrangement of the piston-type compressors; the negative work, therefore, is done at high efficiency. The compressors are driven by a piston engine whose cylinder acts as a combustion chamber, the work of the gases in the piston engine being limited to the negative compression work, the rest of the expansion taking place in the gas turbine proper. Whilst this will undoubtedly give very favourable efficiencies, it will limit the unit output of the machine, as for a given effective output the compressor has to deliver about half the output of the turbine, *i.e.* for, say, a 100,000-kW station, the compressor set would be enormous.

It is designed at present for oil fuel; the jacket system of the turbine, together with a regenerator and feed heater, are utilised in a similar way to the Still engine arrangement for the generation of steam, which is subsequently admitted to the

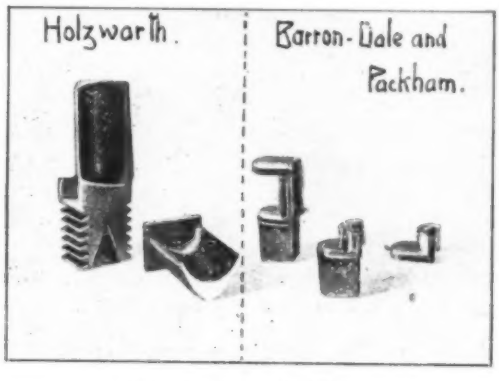


Fig. 7.—Gas Turbine Blades.

turbine wheel. The working pressure of the steam is estimated to be 225 lb./sq. in. absolute. The compressing arrangement and the method of controlling the supply of gas and steam to the turbine form the subjects of the main patents. The air compressor and the high-speed bearings are water cooled, independently of the jacket system; the cooling water will eventually be passed to the hot well. High-pressure lubrication is employed, and the turbine cylinder castings, pattern work, and machining have been done by the English Electric Co. The nozzle diaphragm is of a hard chromium steel, supplied by Brown, Bailey Steel Works Co. The nozzles are of the convergent-divergent type with parallel exits similar to the De Laval type. The rotor disk and shaft are of stainless steel, the blades being of stainless iron, with a very low carbon content; a wheelcase temperature of 400 deg. C. is foreseen. Governing is effected by controlling the steam supply and the injection of oil fuel by a normal governor of the Hartung type, and if the tests should prove that a higher wheelcase temperature may be allowed, the inventors intend to use the bulk of the steam in a steam turbine proper, with condenser, to obtain the advantage of high vacua.

*Turbine of Prof. Stauber, Berlin.*—This is built on the Humphrey cycle, but works on the two-stroke principle. A water column is accelerated by the driving force of gas explosions and, in flowing through the impellers of a water-turbine wheel, renders useful work. The main difficulty of the gas turbine problem, *i.e.*, suitable blading material for withstanding high temperatures, is entirely eliminated. Stauber's patents have been bought by a group consisting of the A.E.G., M.A.N., Krupp, and Siemens-Schuckert concerns. A machine of from 300 to 500 b.h.p. at 500 r.p.m. has successfully undergone preliminary trials in which compressed air took the place of the explosive gases; tests with gas will take place in the immediate future. Fig. 9 shows the type of machine; the

runner consists of a double-bladed wheel with the interconnection of the stationary guide channels through which water is forced by the explosion in a chamber at the side.

The experimental machine running at 500 r.p.m. possesses 24 blade channels, and is working with 200 gas explosions per second, *i.e.*, a very uniform torque. The gas is pre-compressed by the swinging water column to about 90 lb. per sq. in. and

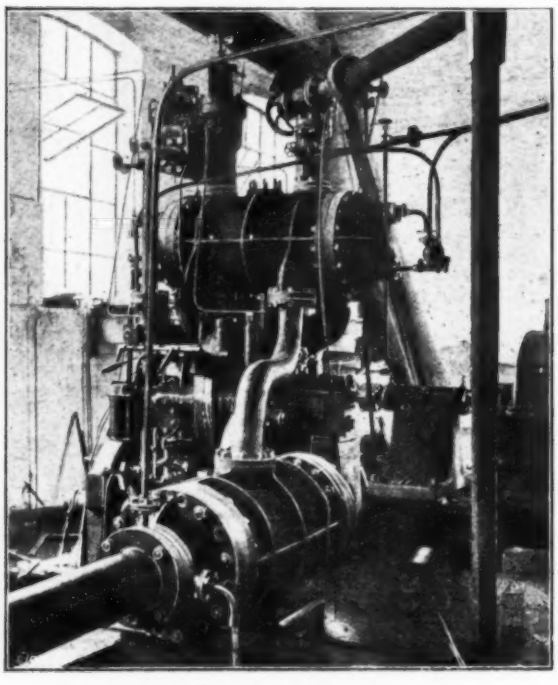

Fig. 8.—A 200-kW Gas Turbine at Chelmsford.

then ignited, reaching a maximum pressure of 200 lb. per sq. in. Prof. Stauber stresses the fact that any inequality in combustion does not disturb the surface of the column, as the pressure in the gas equalises itself with sound velocity.

Prof. Stauber claims as the salient point of his type not efficiency* so much as simplicity of design, and therefore

Fig. 9.—Stauber "Water-column" Gas Turbine.

reliability and great cheapness. Whilst Stauber's solution of the problem is ingenious and mechanically sound, and also promises, so far as thermal efficiencies are concerned, reasonable economy, it is seriously handicapped by the danger of the surface of the water column being torn up and mixing with the gas, thus limiting the peripheral speed of the turbine. Prof. Stauber estimates that for an output of 10,000 kW, the allowable revolutions per minute would only be about 75, which would require very bulky low-speed generators.

*Diesel Exhaust-Gas Turbine.*—A combination of piston engine and gas turbine has been put into effect by Brown, Boveri & Co., and has also been under consideration by the English Electric Co. The design proposed by this company differs from that of the Brown, Boveri Co. and others in so far as only the high-speed portion of the exhaust gases proper, and none of the low-speed scavenging air, is utilised. This is made possible by providing extra ports or valves, shaped so as to give proper expansion, and each cylinder expands its exhaust gases independently of the others. Work on the same problem is also being done in America. It is reported that the Curtis Gas Turbine Co. carried out research work on a prime mover consisting of an exhaust-gas turbine and a special Diesel engine.

The Diesel turbine of Brown, Boveri (fig. 10) utilises the kinetic energy of the exhaust gases of a Diesel engine without any further pressure conversion. Preliminary tests proved that the available energy is about 89 kW, of which the turbine

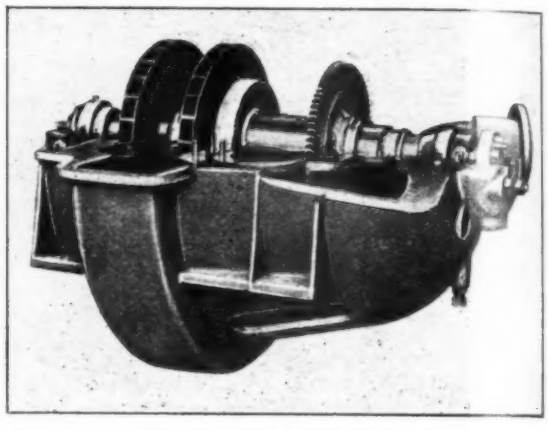

Fig. 10.—Diesel Exhaust-Gas Turbine.

actually renders about 50 or 60 kW, which would be equivalent to an overall efficiency of the turbine of about 56 to 67 per cent. The gas turbine is directly coupled to a centrifugal scavenging blower, with an output of from 100 to 110 cubic metres per minute, at a pressure of 1.5 atmospheres absolute. The speed of the turbo-blower is 8,200 r.p.m., its output is equivalent to from 90 to 100 kW, and it is connected through gearing and hydraulically coupled to the crankshaft of the Diesel engine.

*Field of Application.*—A wide field of application for a successful gas turbine is represented by power plant operating on gas from blast furnaces, coke ovens, and gas producers. In place of gas-fired boilers, considerable saving would be obtained by using the gas direct in internal-combustion turbines, which, furthermore, become of increasing importance with the trend—faintly marked as yet—to avoid the wasteful direct burning of coal by the adoption of low-temperature gasification on a large scale and the recovery of valuable by-products. The gas turbine has already established itself in the field of aerial navigation as an exhaust turbine.

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**Electric versus Steam Locomotive Costs.**—Some interesting detailed figures of the relative costs of operating by electricity and steam locomotives the Rocky Mountain divisions of the Chicago, Milwaukee and St. Paul Railway appear in the *Electric Railway Journal*. The figures include both operating expenses and carrying charges, and have been brought to the same basis. The electrical operating costs are the actual costs for the year ended December 31st, 1923. The steam operating costs are based on the costs of the last year of steam operation, corrected where known to be incomplete, and recalculated to cover the differences which have occurred in labour and material costs so as to represent the price levels of 1923. The figures given include only those accounts for both steam and electrical operation which are affected by the type of motive power. Operating costs common to both steam and electrical operation and carrying charges on investment in property commonly necessary to both forms of operation are omitted. The total saving resulting from electrical operation for the year mentioned is calculated to be $1,271,793 for a volume of traffic of 2,993,507,000 ton-miles. The comparative operating expenses and investment carrying charges are calculated to be:—

| | Operating expenses. | Investment and carrying charges. |
|---|---|---|
| Steam ... ... | $6,335,073 ... | $507,459 |
| Electricity ... | 3,627,940 ... | 1,539,267 |

*Stodola, in his Vth Edition, p. 1,015, estimated a thermal efficiency of 22.4 per cent. The Humphrey pump has actually reached 21.3 per cent. in gas.

# Exports and Imports of Electrical Goods and Machinery in April, 1925.

It will be seen from our table that a satisfactory increase occurred in the value of electrical exports during last month. This was mainly due to a very large rise in the figure for submarine telegraph and telephone cable which fluctuates violently from month to month. Apart from that the only notable increase occurred in the value of exported electrical machinery (unenumerated). There were large declines in the cases of insulated wires and cables, and non-submarine telegraph and telephone wires and cables. The export total was also well above that of April, 1924, again owing to the enhanced values of submarine cable and unenumerated electrical machinery. Rather large decreases were shown by "Other motors and generators" and non-submarine telegraph and telephone wires and cables.

The import total showed a small decline from the March figure, and the only important variations in the separate items occurred in the values of unenumerated electrical machinery —about £30,000 down, and telegraph and telephone instruments and apparatus—an increase of over £36,000. As compared with April, 1924, however, the total showed a substantial increase which was general with the sole exception of carbons.

The only items of interest in the re-export section, which as a whole increased by £8,000, are arc lamps and parts and batteries and accumulators, which rose considerably from the previous month's figures. There was a fairly general increase in the section as compared with the April, 1924, statistics.

The totals for the first four months of the present year are all higher than the equivalent figures for 1924. The increase in the export total is particularly gratifying, although it must be pointed out that, proportionally, the increase in the import total is greater.

| | Exports. | | | Imports. | | | Re-Exports. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Electrical exports for Apr., 1925. | Inc. or dec. as compared with Mar., 1925. | Inc. or dec. as compared with Apr., 1924. | Electrical imports for Apr., 1925. | Inc. or dec. as compared with Mar., 1925. | Inc. or dec. as compared with Apr., 1924. | Electrical re-exports for Apr., 1925. | Inc. or dec. as compared with Mar., 1925. | Inc. or dec. as compared with Apr., 1924. |
| Electrical goods and apparatus (unenumerated) ... ... | £146,057 | − £10,797 | − £23,663 | £101,101 | + £5,513 | + £34,170 | £5,085 | − £600 | + £1,569 |
| Insulated wires and cables ... | 191,867 | − 48,242 | + 3,775 | 45,736 | − 3,886 | + 15,204 | 1,725 | + 402 | + 1,359 |
| Glow lamps ... ... ... | 40,753 | − 2,558 | + 12,433 | 29,567 | + 723 | + 17,954 | 531 | + 165 | + 477 |
| Arc lamps and parts ... ... | 6,980 | + 6,447 | + 6,651 | 941 | + 95 | + 566 | 1,728 | + 1,727 | + 1,728 |
| Batteries and accumulators ... | 75,213 | − 16,708 | + 24,245 | 28,382 | + 1,205 | + 8,289 | 1,832 | + 1,084 | + 1,805 |
| Meters and instruments ... | 34,192 | + 2,114 | − 6,534 | 23,951 | − 3,461 | + 6,262 | 458 | − 450 | + 370 |
| Carbons ... ... ... ... | 2,407 | − 2,249 | − 456 | 8,621 | + 357 | − 3,423 | 109 | − 134 | − 946 |
| *Electrical Machinery—* | | | | | | | | | |
| Electrical machinery (unenumerated) ... ... ... | 313,350 | + 36,520 | + 125,520 | 98,098 | − 29,911 | + 5,946 | 5,419 | + 277 | − 6,168 |
| Railway and tramway motors | 38,357 | − 14,280 | + 11,158 | — | — | — | — | — | — |
| Other motors and generators ... | 151,954 | − 3,482 | − 53,950 | — | — | — | — | — | — |
| Switchboards (not telegraph or telephone) ... ... | 7,162 | + 1,684 | + 1,989 | 151 | + 88 | + 144 | 8 | + 8 | − 901 |
| *Telegraph and Telephone Cable and Material—* | | | | | | | | | |
| Telegraph and telephone wires and cable (not submarine) | 43,734 | − 24,678 | − 76,191 | 14,635 | − 3,741 | + 2,694 | 61 | − 36 | − 333 |
| Submarine telegraph and telephone cable ... ... ... | 290,352 | + 279,586 | + 24[illegible],778 | — | − 24 | — | — | — | — |
| Telegraph and telephone instruments and apparatus ... | 263,103 | + 2,329 | + 26,213 | 102,772 | + 36,243 | + 47,668 | 11,253 | + 5,711 | + 8,231 |
| **Totals ... ...** | £1,605,481 | + £206,286 | + £293,368 | £453 955 | − £6,799 | + £135,474 | £28,209 | + £8,134 | + £7,191 |
| **Increases for the four months ended April, 1925 ... ... ... ...** | | **Exports.** + £1,280,344 | | | **Imports.** + £605,142 | | | **Re-exports.** + £28,600 | |

# Electrical Imports of the Irish Free State.

ELECTRICAL goods and apparatus were imported into the Irish Free State last year to the total value of £397,918, of which £351,173 represented British manufacturers, while electrical machinery amounted to £96,560. Some particulars were given in our issue of March 20th, p. 454, and we now show below the principal classes of goods and the respective shares of Great Britain and Northern Ireland. The share of Belgium and Germany in the wire and cable trade is also set out. In addition there were imports from Germany of other electrical goods and apparatus to the value of £6,800, whilst imports of electrical machinery from Switzerland, were £13,600 in value.

| | 1924. £ |
|---|---|
| *Electrical goods and apparatus :—* | |
| Wires and cables ... ... ... ... ... | 82,000 |
| From Great Britain ... ... ... ... | 60,500 |
| ,, Northern Ireland ... ... ... ... | 6,000 |
| ,, Germany ... ... ... ... ... | 9,500 |
| ,, Belgium ... ... ... ... ... | 6,000 |
| Telegraph and telephone instruments and apparatus ... ... ... ... ... | 28,500 |
| From Great Britain ... ... ... ... | 28,000 |
| ,, Northern Ireland ... ... ... ... | 300 |
| Electric lamps and parts ... ... ... ... | 25,000 |
| From Great Britain ... ... ... ... | 23,000 |
| ,, Northern Ireland ... ... ... ... | 500 |
| Batteries and accumulators ... ... ... ... | 33,000 |
| From Great Britain ... ... ... ... | 29,000 |
| ,, Northern Ireland ... ... ... ... | 1,000 |
| Lighting accessories and fittings ... ... ... | 37,000 |
| From Great Britain ... ... ... ... | 35,000 |
| ,, Northern Ireland ... ... ... ... | 1,000 |
| Wireless sets in parts ... ... ... ... | 94,000 |
| From Great Britain ... ... ... ... | 89,000 |
| ,, Northern Ireland ... ... ... ... | 2,500 |
| Other electrical goods and apparatus ... ... | 99,000 |
| From Great Britain ... ... ... ... | 90,000 |
| ,, Northern Ireland ... ... ... ... | 4,500 |
| *Electrical machinery :—* | |
| Generators ... ... ... ... ... | 13,500 |
| From Great Britain ... ... ... ... | 12,000 |
| ,, Northern Ireland ... ... ... ... | 500 |
| Motors ... ... ... ... ... ... | 17,000 |
| From Great Britain ... ... ... ... | 16,500 |
| ,, Northern Ireland ... ... ... ... | 150 |
| Other descriptions ... ... ... ... ... | 66,000 |
| From Great Britain ... ... ... ... | 50,000 |
| ,, Northern Ireland ... ... ... ... | 2,000 |

# New Electrical Devices, Fittings, and Plant.

*Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.*

### A Small Belt-driven Alternator.

The accompanying illustration, fig. 1, is of a new design of alternator and exciter, specially adapted for power transmission in factories, &c., which is being put on the market by the makers, MESSRS. T. W. BROADBENT, LTD., 17, Queen Victoria Street, E.C.4. The generator is standardised as a three-phase machine, but may be wound for single- or two-phase supply if desired.

The rotor hub, forming the yoke ring, is heavily constructed so as to act as a flywheel and minimise any cyclic irregularity in the driving.

The stator core consists of iron laminations assembled in a cast-iron frame having a number of inwardly projecting radial ribs, the laminations being clamped between cast-iron plates. It is claimed that the winding is almost indestructible in ordinary service.

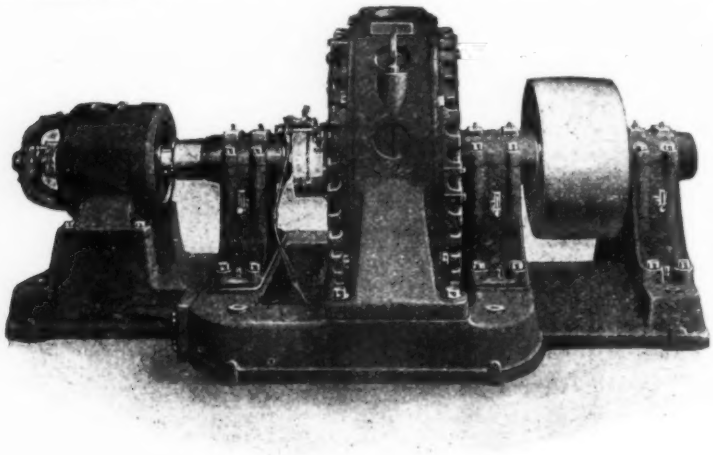

Fig. 1.—The "Broadbent" Alternator and Exciter.

The shunt exciter is normally wound for 110 or 220 V, but in cases where it is desired to use d.c. for lighting, the makers install a specially large compound-wound exciter.

The machine is subjected to the usual tests on completion. It is made in sizes up to 300 kVA at 375 r.p.m., the smallest size being 40 kVA at 1,000 r.p.m.

### The Campbell Frequency Meter.

The accompanying illustration, fig. 2, is of an instrument designed by Mr. A. Campbell for the accurate measurement of acoustic frequencies from about 180 to 4,000 cycles, which is being marketed by the CAMBRIDGE INSTRUMENT CO., LTD., Cambridge. It depends for its operation upon the action of two mutual inductances, the secondaries of which form a closed circuit having a definite resistance for one range. The resistances in this circuit are suitably connected to studs, over which a switch can be moved to change the range. Five ranges are

Fig. 2.—Campbell Frequency Meter.

Fig. 4.—Load Indicator.

provided, covering frequencies varying from about 180 to 400, to 1,800 to 4,000 cycles per second. Final balance is obtained by moving one of the inductances; the head controlling this movement is attached to a pointer which moves over a calibrated scale. The condition of balance is indicated by silence in a telephone receiver and the frequency of the circuit under test is found by multiplying the reading by a factor depending on the particular range used. The makers claim that at 1,000 cycles, readings may be taken to within 0.1 per cent. accuracy.

Provision is made on the lower ranges for correcting small errors due to temperature variations. The external dimensions of the instrument are 16 by 11 by 8 in., and it weighs 15 lb.

### A New Switch Plug.

We have received particulars of a new design of switch plug, the "Homof," which is being put on the market by MESSRS. BERRY'S ELECTRIC LTD., 85, Newman Street, Oxford Street, W.1. This switch plug is d.p., and is made in two sizes, 20 A, 500 V, and 30 A, 250 V. It is of the non-reversible type and is hence suitable for use in battery charging and other d.c. work. In accordance with the Home Office requirements, the contacts both in the plug and base are concealed when the plug is withdrawn, giving protection to the contacts against trailing of the plug. The contacts are of the blade and clip design.

Fig. 3.—The "Homof" Switch-plug.

The main feature of this device is the quick make and break switch action without any other operation than the insertion or withdrawal of the plug, the switch action being brought about by this operation. The operating springs are remote from the contacts. Suitable earthing provision is made on both plug and socket. Fig. 3 shows the "Homof" with the plug out of position.

### A Metric Slide-Rule.

A convenient means of ascertaining the metric equivalents of English weights and measures, and *vice versa*, has been devised by Mr. A. E. HARLEY-MASON, of the Cavendish Press, Cheam, in the form of a slide-rule. Considering the ordinary pattern of slide-rule, Scales A, B, and C are unchanged, but C carries one arrow-head, and in place of D there are nine gauge-points, marked "litre-gals.," "m-yd.," "kilo-lb.," &c. On setting the arrow-head to one of these points, the corresponding conversion is effected by reading the equivalents, in either direction of conversion, against each other on scales A and B. These two scales can also be used for ordinary arithmetical operations, and scale C as usual gives square roots.

On the back of the rule are tabulated the principal conversion ratios, with which more precise conversions can be made in case of need. The rule covers a wide field in a small space, and should be found very useful.

### A Load Indicator for Transformers.

The *Electric Railway Journal* describes a load indicating device for distribution transformers which compensates for ambient temperatures, and which is a recent development of the GENERAL ELECTRIC COMPANY, Schenectady, N.Y. This device, which is illustrated in fig. 4, is suitable for transformers of the types used for miscellaneous purposes on the a.c. circuits of electric railway systems. The instrument consists of two electrical thermometers connected in series. The first thermometer is actuated by the heat of the transformer's top oil; the second, located in the external case, is actuated by the ambient temperature and modifies the reading of the first.

The composite reading given by the pointer closely approximates the internal coil or hot spot temperature and, for convenience, is given in terms of "per cent. equivalent load." This is the proportion of the safe continuous output of the transformer, represented by the load cycle causing the indication. The dial is calibrated to indicate for 50 to 125 per cent. equivalent load. A semaphore is tripped by the mechanism and swings into view when the instrument registers more than 100 per cent., equivalent load. A resetting lever extends below the external case.

# Heating Water by Electricity.

## A Public Baths and Wash-house Installation.

By J. HOPE, Baths Superintendent, Poplar.

(*Abstract of paper read at the* ANNUAL CONFERENCE OF BATH SUPERINTENDENTS *at Leeds.*)

SWIMMING baths are kept at an average temperature of 74 deg. F. in this country; the average temperature of water in the town mains is about 50 deg. F., and the average temperature of water used for private baths is 110 deg. F. For an average slipper bath requiring 30 gallons of water at bathing temperature (110 deg. F.), the difference between that and the average temperature (50 deg. F.) is 60 deg. F. As a gallon of water weighs 10 lb., it follows that 18,000 B.th.u. are necessary to heat one bath of water. Similarly, in the case of a swimming bath containing, say, 80,000 gallons of water, which requires heating from 50 to 74 deg. F., the difference is 24 deg. F., and 19,200,000 B.th.u. are needed.

The average heat value of coal used for firing boilers is about 12,000 B.th.u. per lb., which means that if it were possible to get 100 per cent. of the heat from the fuel, less than 15 cwt. of coal would be required to heat a bath of water of the previously-mentioned capacity. During bath-warming periods, the boiler plant is doing its full capacity, and therefore likely to be most economical. Those superintendents who burn, say, three tons of coal for this purpose, and I am informed that most of us do, will appreciate that their boiler plant is only 25 per cent. efficient, but their plant may be in fairly good condition; this fact illustrates the huge losses that occur in heating water under the usual conditions attaching to a steam boiler plant.

When considering the coal costs for heating water for slipper baths, one finds a still greater discrepancy, largely due to the fact that the power plant is not being worked efficiently for the major portion of each week. The week-end bath is part and parcel of the British race, and to effectively deal with our busiest hours on Saturdays usually means a wasteful plant during the early part of the week. Taking my previous figures regarding slipper baths and assuming the price of coal to be £2 per ton, with plant of 25 per cent. efficiency, the coal cost per bath would be approximately 1.2d. In a small establishment comprising a swimming bath and a number of slipper baths I found, during a winter quarter when the swimming bath was not being used, that the fuel consumption was 44 tons. The number of bathers during this quarter was 3,904. Presuming the coal to have cost £2 per ton—actually it was a little less—the fuel cost per bath would have been 5.4d., an increase of 4.2d. per bath. This does not mean that the boiler plant was not in good order; on the contrary, I can assure you that it was in excellent condition, but owing to our business being very seasonal and intermittent, huge heating losses are bound to occur. The quantity of coal burned (namely, 44 tons) should, with 25 per cent. efficiency, have provided sufficient hot water for 16,426 bathers, but only a quarter of this number was recorded, the majority of them using the baths on Saturdays. It is thus apparent that there is something wrong somewhere, and not solely in the one establishment I have just mentioned.

When my Committee decided to erect new establishments, I had fuel costs in mind, and so that the plant should be sufficiently elastic to be able to deal with our week-end rush and also use a minimum amount of fuel during our slack early week periods, it was agreed to erect small cottage baths consisting of 20 slipper baths only. I installed a series of small gas boilers, all of which could be used at the busy periods, and only one, or any number as desired, at the other periods. The success of this system may be judged by the fact that the cost per bath for gas during the same winter quarter as the one previously mentioned worked out at 2.23d., the charge for gas being at the rate of 3s. 9½d. per 1,000 cu. ft., and the bathers during the period numbering 5,522.

So far, fuel costs only have been taken into consideration; but three men were necessary to attend to the coal-fired boiler and slipper baths, whilst in the case of the gas-fired boilers the third man is quite unnecessary, as the boilers are automatic in action, being controlled by thermostatic valves. When I installed the gas boilers I was led to believe that, as a large consumer, I should obtain the usual trade discount. Being disillusioned by the directors of the gas company, and having a real live electrical engineer in the borough, it was decided to experiment with electricity. The experiment has successfully functioned for the past two years.

Electric water-heating plant was installed at a cottage bath comprising 20 slipper baths to heat sufficient water for one-half of the building. A small tubular boiler was connected to a tank of 4,000 gallons capacity, which is placed directly above the boiler, sufficiently high to give a gravity feed to the baths. Our calculations, however, had been so generous that it was found possible to supply the whole 20 baths with hot water, instead of just half the number. The gas plant previously installed has never since been required, and has recently been removed.

The number of B.th.u. in a Board of Trade electrical unit is 3,400, and in order to heat our bath of water of 30 gallons 18,000 heat units (approximately 5¼ kWh of electricity) would be required with 100 per cent. efficiency of heat transmission. Our borough electrical engineer agreed to supply electricity at off-peak times at a little over station fuel costs. We were allowed the use of electricity from 5 p.m. to 8 a.m., after 1 p.m. on Saturdays, and between 12 noon and 2 p.m. every day. The price per kWh varies as the price for fuel, but on the first quarter's working (September) the charge per kWh was 0.517d. During the quarter we recorded 6,792 bathers, which made the cost per bath 2.33d., the remarkable figure of 4.52 kWh per bath being recorded. After the illustration of the losses involved in heating water by means of a steam boiler, the importance of this figure will be the better appreciated.

It is, of course, true that the average temperature of the cold water during this quarter would be a little higher than the average yearly temperature of 50 deg. F. The figures for the December quarter, however, only show a usage of 6.04 kWh per bath, which conclusively proves the efficiency of an electric boiler as a heat transmitter. As a set-off against this, station fuel costs were less, and it is therefore quite patent that for establishments comprising a swimming bath and a number of slipper baths, steam boiler plant sufficiently large for a summer trade is most uneconomical during the winter when the swimming bath is closed.

One of the greatest factors of success with our electrical heating plant was the provision of a hot-water tank sufficiently large to cope with our busiest day's demands; 4,000 gallons of water at, say, 170 deg. F. is sufficient to bathe about 300 people, which number is an average Saturday trade at this establishment. Even though our plant might not be sufficiently large to heat the required quantity of water for our busiest hour, we have sufficient reserve to serve a busy day. This means that with sufficient storage capacity—on the gravity system—much smaller plant is required than would otherwise be necessary to meet the busiest hour's demands, and consequently a much smaller first cost and a very much more economical running cost.

In our case, heating is carried out exclusively during the night, the quantity of hot water being accumulated gradually during the week to give the maximum amount to start with on Saturday mornings. The great question is thus one of straightening out the peak-load curve; bathers cannot be made to come at our pleasure, no matter what inducements may be offered in the form of cheaper facilities during the early part of the week. The Saturday night hot bath is an institution, neither can we control our climate.

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**Standardising American Motor-Car Battery Ratings.**—A definite agreement as to the rating of storage batteries is being sought by the American Society of Automotive Engineers through the storage battery division of its Standards Committee, which favours some m dification of the present standard. The question affects the selection of both equipment and replacement batteries. The present S.A.E. standard provides for rating car batteries on the basis of discharges at 20-minute and also at five-hour rates. This dual test was devised to reveal the character of the battery when employed for engine starting and also when supplying light, the requirements in the two instances being quite different from the standpoint of battery performance.

Another method long used by battery makers, and still employed to some extent, is to determine the ampere-hour capacity of the battery when discharged continuously at the rate of five amperes. Rating on the basis of a 20-hour discharge has also been proposed, as has an intermittent 72-hour discharge. Each of these methods has advantages and disadvantages, and consequently its adherents and opponents. Wide discussion is therefore being sought with the object of reaching a definite agreement on one general method of rating. It is urged that "battery manufacturers should do all in their power to inspire the confidence of the public in the matter of rating batteries. That the ratings should be such as the public, as well as the manufacturers, can understand, and they should be technically beyond criticism and on a basis that may logically be extended to future changes and extensions in battery usage."

# Trade with Brazil.

A FEW weeks ago we dwelt at some length upon certain strictures that were passed upon British electrical traders by a correspondent of the fortnightly organ of the Federation of British Industries, for their apparent lack of interest in and attention to, at any rate certain parts of the Brazilian market.

We now have before us a number of other contributions to our knowledge of the situation out there, and in view of the prospect of South American affairs taking a larger place in international trading and enterprise, we place these additional reflections on record.

From one source we learn that the political situation in Brazil is still sufficiently uncertain to impair confidence and check any increase in the general volume of transactions and the commercial position has shown little definite, or at any rate, widespread, change. Disturbances of a revolutionary character continue in the Southern States, while in São Paulo the difficulties of the industrialists have been increased by the shortage of electric power supply that has resulted from the untimely drought. The flow of water at the hydro-electric installations has been so low that current consumption has been severely curtailed, and, in consequence, manufacturers have been obliged to reduce their working hours, in some instances to one-third of the usual time. In these circumstances, and as the normal dry season is now at hand, the local power supply company has waived its monopoly rights, and users of electricity have been taking steps to obtain their own generating plant. In these endeavours they appear to have been unable to awaken much interest on the part of British engineering firms, and the apathy of the latter in the face of an opportunity for obtaining some good orders has been keenly criticised locally. It is true that certain concerns have been wide awake and have consequently benefited by good orders for Diesel engines and generators, but it is believed that had the British engineering firms displayed as keen an interest in the various inquiries for machinery as their American, German, Swiss, and Swedish competitors, a much larger share of the contracts—totalling several hundred thousands of pounds in value—would have come to the United Kingdom. It is alleged that the business was not lost because of high prices, but because of lack of promptness in sending detailed quotations and specifications. The Chairman of the British Chamber of Commerce of São Paulo and Southern Brazil referred to this matter at a recent council meeting, and it was agreed to call the attention of manufacturers to it. The *Journal* of the Chamber remarks:—

> "It is not our intention to make a sweeping statement, but, in view of the continued decline in, and the unsatisfactory outlook for, British export trade, it would seem that there is much room for improvement in the present methods adopted by British manufacturers and that they should at least give their agents the same measure of support as is given by competitors. The unfavourable showing of British trade with Brazil for 1924 is not due to a marked decline of the buying power of this country, but is brought about, in great part, by the niggardly and unfavourable attention which many manufacturers give to the requirements of this market."

The second contribution concerning the Brazilian situation relates to the wonderful potentialities of the country, and occurred in a speech delivered at the annual meeting of the Pernambuco Tramways & Power Company, Ltd., held in London on May 5th. Mr. William Higgins, the chairman of the company, showed that at the date of the incorporation of the company in 1913, Brazilian exchange was quoted at 16d., whereas on May 5th it was about 5¼d.! Operations under the constructional programme were started under favourable auspices, but the war broke out in 1914 and British, French and Italian friends who had considerable financial interests in the company so far felt the burden that instead of proceeding full speed ahead the concern was compelled to slow down to the lowest possible limit and that at a time when progress would have been in the best interests of the company. When they were once more in a position to proceed actively with the programme, prices of material had risen to an abnormal extent so that the capital account is bigger than was originally anticipated. So much for the company's own domestic difficulties, which will be considerably relieved as the return of the exchange to anything like a reasonable rate brings prosperity. With reference to the general Brazilian outlook, Mr. Higgins remarked that there were immense tracts of country there hitherto unexplored by what we are accustomed to call "the white man." The natural resources were the greatest in the world. "All that is wanted is development. Capital can be found on this side for development if a reasonable security and return can be obtained." The speaker went on to allude to the recommendations of the Commercial Commission from this country which visited Brazil. If a sane policy were adhered to Brazil would emerge from her present financial position and take her proper place as one of the greatest countries in the world.

The third statement to which we may refer is an article in *The Times Trade Supplement* for May 9th, written by a correspondent at Rio de Janeiro and entitled "Keen Competition in Brazil." This writer says that it cannot be doubted that although British exports to Brazil compare favourably with those of other countries, British trade is suffering acutely from the competition of others among Brazil's chief suppliers. An outstanding reason for this is that while the milreis stands in better relation to French, Belgian and Italian currency than before the war, it has lost two-thirds of its sterling value—the same being the case in its relation with American and Canadian dollars. With regard to Germany it is clear that not only is labour cheap, but it is yielding a better output per unit than in Great Britain. The competition of Continental countries is eating more and more into British trade owing chiefly to the price factor. Railway and construction supplies, many classes of machinery and electrical goods, and other imports are all being obtained elsewhere at lower rates.

British exporters are hard to convince that consumers do not always value "the best" when they get it. German and other manufacturers supply grades which not only suit the views of customers but give sufficient satisfaction in actual use. They may not last so long, but they may last as long as they are wanted or are expected to last, and being much cheaper they tie up less capital. In these days when Brazil is producing by her own industries so much of the lower grade goods that she requires, German supplies naturally suffer more in these circumstances than English higher grade articles, yet we lose to German and other competitors a great deal in supplies of goods of fair and serviceable quality but not high class. There has been a considerable advance in the attention paid by British exporters to the requirements of Brazilian customers, but there is still room for better organisation in the direction of this market.

# Parliamentary.

[By Our Special Parliamentary Reporter.]

**A Wembley Delay.**—On May 13th, Sir W. DAVISON asked the Prime Minister whether his attention had been called to the action on the part of certain representatives of the Electrical Trade Union who, on the eve of the opening of the British Empire Exhibition, removed the fuses and put out of action various electrical appliances both at the Colonial Office exhibit in the British Government pavilion and elsewhere, on the ground that parts of certain electrical apparatus had been made, or partially made, by men who were not members of their union; and what action the Government had taken, or proposed to take, in the matter.

SIR H. BARNSTON said he had been asked to reply. It had been agreed by the British Empire Exhibition authorities that all electrical work in the Exhibition, including the Government Pavilion, was to be carried out by members of recognised trade unions. In the case referred to, the installation of certain electrical apparatus, which arrived at a late hour on the day prior to the opening, was held up for a short time until arrangements could be made for its installation by trade union labour. There was no interference with the working of any appliances.

**Amateur Wireless Transmitters.**—On May 11th, Viscount WOLMER, Assistant Postmaster-General, informed Capt. Garro-Jones that licences were issued to a large number of experimenters covering the use of wireless sending apparatus of a power of 10 watts on a band of wave-lengths from 150 to 200 metres and on an additional wave-length of 440 metres, which might only be used outside broadcasting hours. In special cases experimenters were authorised to use other wave-lengths and to employ increased power up to a maximum of 1 kW.

**Bradford Corporation Bill.**—This Bill was considered by the Local Legislation Committee of the House of Commons, presided over by Lieut.-Colonel Sir Joseph Nall, last week. Among the provisions of the Bill is one seeking power to construct separate tramway tracks above the level of the ordinary carriageway on roads with a carriageway not less than 60 ft. wide. The West Riding County Council, and motoring interests opposed.

In reply to a question as to whether there were precedents for granting the powers asked for, Mr. W. E. TYLDESLEY JONES, K.C. (for the Corporation), said that Liverpool and Birmingham had separate tracks, but he believed they were authorised only in specified cases. The Leeds Corporation had secured the passage through the House of Commons of a clause authorising the principle generally, subject to certain conditions.

Mr. W. J. JEEVES, K.C. (for the West Riding County Council), said the Leeds clause only authorised this particular form of construction in particular cases, for roads within the city.

Mr. F. MARSDEN (City Engineer and Surveyor, Bradford) said that the Corporation was willing that the tramway track should be, as a rule, in the middle of the road, but there were places where it might be advisable to adopt side tracks. The Corporation's view was that in each case the best course should be decided by the Ministry of Transport after hearing all the interests concerned. Outside the city the separate track system would only be adopted with the consent of the road authority, if such consent should not be unreasonably withheld. There was no intention of fencing off the track, and crossings for vehicles would be provided about every three or four hundred yards.

Mr. W. J. JEEVES, K.C., addressing the Committee on behalf of the West Riding County Council, and the local authorities affected, asked that there should be no interference with the autonomy of local authorities.

Mr. FRYER (Deputy Secretary and Roads Manager of the Automobile Association) said his Association objected to the power enabling the Corporation to adopt, with the consent of the Ministry of Transport, any new method of tramway construction, and considered that in such a case the Corporation should come to Parliament for powers.

The Committee decided that, within the Borough, the approval of the Minister of Transport should be required, and outside the Borough the approval of the road authority and the Minister, not subject to appeal, if the road authorities failed to agree. Where the tramway was in the centre of the road, the total width of the road should be not less than 100 ft., and the width of the carriageways must not be less than 53 ft. (half on each side). Where the track was at the side of the road there should be a carriageway of not less than 40 ft.

**Crystal Broadcasting Reception.**—On May 13th, Mr. BARNES asked the Postmaster-General whether he was aware that owners of crystal sets in the East End of London were experiencing difficulties in the reception of London programmes; and whether he would make representations to the British Broadcasting Company to improve its service.

VISCOUNT WOLMER, the Assistant Postmaster-General, said that representations had been made to the British Broadcasting Company, which had replied that while satisfactory reception was still possible with efficient crystal sets up to a distance of 20 miles from the new station, it was hoped, by an alteration in the transmitting apparatus, to increase the strength of the signals in East London at an early date. It was only fair to add that reception in London on the whole had been improved by the change.

**Electrical Development.** — On May 13th, Mr. THURTLE asked the Minister of Transport how soon he expected to be in a position to state the Government's plan for providing work for the unemployed in connection with the development of the electrical industry.

COLONEL ASHLEY said the whole question of the supply and distribution of electricity was under consideration and considerable progress had been made, but he was not yet in a position to add anything to previous answers. The Government was giving financial assistance, through the Unemployment Grants Committee, to electrical schemes which were being expedited for the purpose of relieving unemployment.

**Blackfriars Power Station.** — On May 14th, Mr. MONTAGUE asked the Postmaster-General whether, seeing that the Blackfriars power station was to be closed down, a contract or contracts for the supply of bulk electricity had been accepted from private sources; if so, what was the price to be charged; and for how long did the contract run.

SIR W. MITCHELL-THOMSON said that an appreciable saving would result from taking electrical energy for the Post Office from an outside source, and he had accepted the most favourable tender received, which was that made jointly by the City of London Electric Lighting Co. and the Charing Cross Electricity Supply Co. The period of the proposed contract was 25 years; the price of energy varied on a sliding scale according to the cost of fuel and the incidence of the peak load.

**Length of Wireless Aerials.**—On May 15th, Sir W. MITCHELL-THOMSON informed Mr. Day that the question of increasing the standard size of wireless aerials had recently been considered, but the conclusion reached was that such an increase would not be in the general interest. Where, however, there were special reasons for requiring the use of a larger aerial, permission was given on application.

**Newport Corporation Bill.**—When this Bill was considered by the Local Legislation Committee of the House of Commons recently the Newport Gas Co. petitioned for the insertion of a proviso in a clause relating to the acquisition and development of lands. This proviso was to the effect that the Council should not make it a condition of any tenancies which it might grant that a particular form of light, heat, or power should be used exclusively on the premises. It was stated that the petition arose from the fact that upon two of the Corporation's housing estates it had been stipulated that only electricity should be used for lighting. It was explained by the Town Clerk that this had to be done to justify the laying of cables. While a member of the Committee thought that there could be no objection to the insertion of the required proviso, the Town Clerk objected to it, not desiring to create a precedent for future clauses of the same nature.

The Committee decided that the proviso should be added to the clause.

**London Electricity Bills.** — On May 14th, the London Electricity Supply (No. 2) Bill was considered on report. A new clause, moved from the Labour benches, safeguarding the rights of Stepney, was agreed to.

DR. SALTER, a Labour member, moved a new clause providing that the Joint Electricity Authority, which was the new purchasing authority for London, might, on giving not less than three years' notice, require the London electricity companies to transfer their undertakings at any subsequent period of ten years up to December 31st, 1961. He contended that it was not right that London should have its hands tied for 50 years with regard to a vital public service.

COL. MOORE-BRABAZON, the Parliamentary Secretary to the Ministry of Transport, in resisting the amendment, said the Government regarded the establishment of a Joint Electricity Authority in London as basic to the real development of electricity in this country. If the agreement made between the London County Council and the companies was broken on this basic point the whole question would be flung back into the melting-pot.

The proposed clause was rejected by 226 votes to 105 and the report stage was concluded.

On the third reading Mr. Lansbury opposed the Bill, contending that the supply of electricity should be in the hands of the municipalities. At Poplar, for instance, out of the profits made from the municipal electricity undertaking, the cables for electricity were now being laid down in every poor street in the borough, and within a few months there would not be a house that had not been wired by the borough. But where private companies owned the electricity, the poor people had little chance of getting it.

The Bill was read a third time by 251 votes to 100, and the No. 1 Bill was also read a third time, with a clause added to safeguard the rights of Stepney.

**Middlesex County Council Bill.**—This Bill was considered by a Committee of the House of Commons, presided over by Colonel Wheler, last week. Its object is to confer further powers upon the County Council and the Metropolitan Electric Tramways, Ltd., in connection with tramways and light railways; to empower the County Council to construct tramways and carry out street improvements; and to grant to the Metropolitan Electric Tramways, Ltd., a new lease of certain light railways in the county.

There were petitions from electricity supply companies supplying electricity in the county against a clause in the Bill which proposed to give the County Council power to apply to the Minister of Transport for revision of the prices charged for electricity. A petition was also deposited by motoring interests against a proposal to empower the County Council to construct separate tracks for tramways on roads of a minimum width of 100 ft.

Mr. W. E. TYLDESLEY JONES, K.C. (for the County Council), said that the County Council had granted leases in respect of tramways to the Metropolitan Electric Tramways, Ltd., for a term expiring in 1925, but that term had been extended subsequently to December 31st, 1930. The company had had to pay a rent equivalent to 5 per cent. upon the cost incurred by the County Council in constructing the tramways, and 45 per cent. of the net revenue from the working of those tramways, though the Council had not received anything in respect of the latter since 1911. The leases also provided that the company should maintain the track. Complaints had been made with regard to the maintenance of the track, and negotiations were instituted with a view to the company's surrendering the existing leases, and receiving a new lease on slightly different terms. The main difference to be provided for in the new lease was that, instead of the company being responsible for the maintenance of the track, the Middlesex County Council should undertake the responsibility, and that the company should pay a sum on account of maintenance by the County Council.

Mr. F. G. THOMAS, K.C. (for the County Council), dealt with the clause to which objection was raised by the electricity companies. He pointed out that, with regard to gas charges, the County Council was one of the authorities entitled to make representations to the Board of Trade for revision, and it seemed difficult to see why any distinction should be drawn between gas and electricity charges. County Councils generally were not included in the general legislation which regulated the right of the public to complain of charges for electricity, and the London County Council was the only county council which had that power. There were two petitions, namely, by the Metropolitan Electric Supply Co. and the Hendon Electricity Supply Co., both on the same lines. In the first of these it was stated that the Bill proposed an alteration of the general law, and if the provisions sought were sanctioned, they would become precedents for applications for similar clauses by other county councils in future sessions of Parliament, and there would gradually arise, through piecemeal legislation enacted from time to time with respect to various county councils in England, a substantial alteration of the general law governing the revision of prices and methods of charge. Even if the proposals of the clause were expedient or justifiable, they ought to be dealt with by public legislation applying to the whole of England, after due consideration of all the interests affected.

Commenting upon the petition, Counsel said that if it were reasonable that 20 consumers of electricity should have the right to apply to the Minister of Transport for revision of price, it seemed unreasonable that a great county council should not be given that power. The North Metropolitan Electric Power Co., which was a distributing company, was including in its Bill in the present Session of Parliament the power now sought by the County Council in its Bill.

A report had been received from the Minister of Transport, who had suggested that the point of principle involved could more properly be dealt with by public legislation than by private Bill, and that clear justification should be shown for the differential treatment sought by the Middlesex County Council.

The Committee decided that the matter should be dealt with by general legislation, on the lines suggested by the Minister of Transport and did not accept the clause.

The petition of the Automobile Association, in conjunction with the Society of Motor Manufacturers and Traders and the Association of British Motor Manufacturers, was then dealt with.

Mr. SYDNEY TURNER (for the County Council) said that the clause, as originally inserted in the Bill, provided that, in the discretion of the County Council, when it was altering the position of a tramway in a road whose width was at least 100 ft., it might construct the track separate from the rest of the road and fence it off, and it would then, to all intents and purposes, cease to form part of the public highway. The clause had since been amended, to provide that only with the consent of the road authority could this power be exercised, but if consent were unreasonably withheld, the matter could be determined by the Minister of Transport. The track was not to be more than 35 ft. wide, so that there must be at least a width of 65 ft. left for the ordinary traffic, including the provision of footpaths. The tramway could be put in the centre of the road, with a carriageway on each side, or, alternatively, it could be placed at one side of the road. The present intention of the Council was to place the track in the centre. It was stated by the petitioners that, in the interests of motor vehicle users, they objected to the encroachment upon the road of one particular class of traffic, but Mr. Turner urged that the intention was not to give preference to any particular class of traffic, but to provide facilities for all classes of traffic in the best possible way.

Mr. FITZGERALD (for the petitioners) said that unless adequate safeguards for motor vehicle users were provided, the petitioners would offer the most strenuous opposition to the proposal. They considered that the safeguards should be:—(1) The minimum width of road to which this clause should apply should be 120 ft. instead of 100 ft.; (2) whereas the clause allowed the separate tramway track to be constructed either in the centre or at the side of the road, the petitioners asked that it should only be constructed in the centre; (3) that on each side of the central tramway track there should be a 30 ft. carriageway.

The Committee adjourned the proceedings until May 25th, in order to obtain the views of the Ministry of Transport.

**Wolverhampton and Walsall Corporation Bills.**—On May 12th the Local Legislation Committee of the House of Commons resumed consideration of the former Bill. As reported in our issue of May 8th (p. 760), an adjournment was made to enable the authorities concerned to confer with the object of arriving at an agreement with regard to the railless trolley proposals of the Corporation. Sir LYNDEN MACASSEY, K.C., for the Corporation, stated that a conference had been held, but no settlement had been arrived at.

Mr. MONTGOMERY, for the Wolverhampton Tramways Co., said that his clients took the view that the system should be dealt with as a whole and not piecemeal.

Mr. CHARTERIS, K.C., for the opposing local authorities, supported this view. He said that it would be regrettable to take single portions of the route and change the transport methods on that route with no regard to the arrangements of the whole area.

Mr. HARKER, who appeared for the Walsall Corporation, said that his clients were prepared to give the local authorities a power of veto, and were prepared to purchase the line between Walsall and Willenhall.

Mr. A. J. SILVERS, manager of the Wolverhampton Corporation Tramways, gave evidence in support of the Bill. He said that it would be far cheaper to substitute railless traction than to renew the worn-out track. He denied that the Wolverhampton portion of the track had been neglected.

Mr. A. BAKER, general manager of the Birmingham municipal tramways, said that he favoured through running between Walsall and Wolverhampton. He also stated that in Birmingham the replacement of tramways by railless traction had resulted in an increase of 50 per cent. in the number of passengers. The Committee then adjourned.

On the following day the Chairman said that the Committee should be provided with a financial statement showing the effect, on five-years' and ten-years' bases, of the substitution of railless traction.

Mr. CHARTERIS said that his clients had decided to accept the Corporation's offer to purchase the tramway in Willenhall, in 1928, and to continue its railless service to Willenhall. This proposal had no relation to the Willenhall-Walsall line.

Mr. MONTGOMERY, K.C., asked for protective clauses to ensure that the tramway company would not be left with the portions of unremunerative line on its hands.

The Chairman said that the Committee would first hear the proposals of the Walsall Corporation, and Mr. HARKER then opened the case for that Corporation's Bill.

He said that it was opposed by Wednesbury and the Urban Councils of Willenhall, Darlaston, Bilston, and Tipton. The main proposal was to purchase the part of the Wolverhampton Tramway Co.'s track between Willenhall and Walsall, and run a railless trolley service.

Mr. C. BURGESS, manager of the Corporation tramways, said that if the track were reconstructed the result would be an annual loss of £729, whereas, with the trolley service, there would be an annual surplus of £942. If there were a through service between Walsall and Wolverhampton, there would be an increase of 10 per cent. in the revenue. The Committee then adjourned.

# Published Specifications.

**Compiled expressly for this journal by Patent Agents.**
**The name of the applicant's patent agent, if any, will be found on the printed specification.**
**The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.**

## 1923.

32,344. "Dynamo-electric machines." H. C. E. Jacoby and Enclosed Motor Co., Ltd. December 27th, 1923. (232,657.)

## 1924.

1,374. "Telephone receivers." R. M. Mackison. January 17th, 1924. (232,662.)

1,504. "Electric asynchronous machines." V. Martinetto. January 29th, 1923. (210,427.)

1,564. "Electromagnetic relays for use in railway signalling or like systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. January 19th, 1924. (232,664.)

1,721. "Apparatus for receiving wireless signals." D. S. B. Shannon. January 22nd, 1924. (232,672.)

1,733. "Electrically-propelled road vehicles." C. Forward. January 22nd, 1924. (232,674.)

2,035. "Suspension chains for electroliers or the like." J. H. Stevenson. January 25th, 1924. (Cognate applications 2,950/24 and 3,408/24.) (232,686.)

2,041. "Automatic or semi-automatic telephone systems." Coventry Automatic Telephones, Ltd., J. E. Collyer and C. W. Wilman. January 25th, 1924. (232,691.)

2,085. "Resistance switches for electric lamps." F. Williams and Dimmers, Ltd. January 25th, 1924. (232,695.)

2,086. "Fluorescent screens for X-ray purposes." L. A. Levy and J. W. Mason. January 25th, 1924. (232,696.)

2,131. "Circuit arrangements for selectors in telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. January 26th, 1924. (232,699.)

2,139. "Rectifying systems for alternating currents." British Thomson-Houston Co., Ltd. March 6th, 1923. (212,524.)

2,154. "Dimming devices for electric vehicle lamps." F. Williams and Dimmers, Ltd. January 26th, 1924. (232,701.)

2,246. "Semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., A. F. Bennett and C. Gillings. January 28th, 1924. (232,702.)

2,348. "High-frequency coils for radio-telephony and the like." J. Gray. January 29th, 1924. (232,704.)

2,605. "Starters for electric motors." Morgan Crucible Co., Ltd., and C. C. Gow. January 31st, 1924. (232,708.)

2,690. "Combined gramophonic and wireless sound-reproducing means." E. A. Graham. February 1st, 1924. (232,710.)

2,993. "Electrical regulator systems." T. W. Ross, C. Ryder, A. F. Thompson and Metropolitan-Vickers Electrical Co., Ltd. February 5th, 1924. (232,718.)

3,469. "Combination electrical switch appliance for controlling, cutting out, and relighting radio valves as made use of for wireless transmitting and receiving sets." A. Hitchon. February 11th, 1924. (232,725.)

3,636. "Telephone systems." Western Electric Co., Ltd. (G. Deakin). February 12th, 1924. (232,726.)

3,739. "Electron discharge devices." Western Electric Co., Ltd. April 21st, 1923. (214,584.)

5,605. "Electric signalling apparatus." W. B. Dale, R. A. Hopkinson and J. Hopkinson & Co., Ltd. March 4th, 1924. (232,737.)

6,310. "Acid and chemical proof structures for electrolytic, metallurgical and chemical operations." Consolidated Mining & Smelting Co. of Canada, Ltd., F. S. Willis and E. A. Stimmel. March 12th, 1924. (232,742.)

8,162. "Connectors for electrical leads." A. W. G. Tucker and Ferranti, Ltd. March 31st, 1924. (232,757.)

8,274. "Dynamo-electric machines." C. A. Vandervell and C. A. Vandervell & Co., Ltd. April 1st, 1924. (232,758.)

8,546. "Line balances for loaded telephone circuits." General Electric Co., Ltd., and A. C. Bartlett. April 4th, 1924. (232,762.)

8,782. "Electric conductors." Fuller's United Electric Works, Ltd., and A. P. Welch. April 7th, 1924. (232,764.)

9,299. "Device for safeguarding the filaments of thermionic valves." T. S. Armstrong. April 12th, 1924. (232,768.)

9,826. "Fittings for telephone headpieces." P. Elphick. April 17th, 1924. (232,771.)

10,696. "Electrical condensers." W. Dubilier. April 30th, 1924. (232,782.)

10,759. "Bearings for electric and fluid-operated regulators." F. B. Dehn (Neufeldt & Kühnke). May 1st, 1924. (232,784.)

11,912. "System for repeatedly raising the frequency of electric currents." Western Electric Co., Ltd. May 15th, 1923. (Patent of addition not granted.) (216,132.)

12,115. "Systems of electric ship propulsion." British Thomson Houston Co. (General Electric Co.) May 16th, 1924. (232,794.)

13,017. "Electric batteries." R. W. James (Manhattan Electrical Supply Co., Inc.) May 27th, 1924. (232,802.)

13,113. "Headlights and other lamps." F. S. Garford and J. W. Caldwell. May 28th, 1924. (232,803.)

13,585. "Controllers for electric motors." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 4th, 1924. (232,807.)

13,586. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). June 4th, 1924. (232,808.)

14,439. "Direct-current rotary transformers, with arbitrarily variable subdivision of pressure." A. Della-Riccia. June 14th, 1924. (Addition to 172,969.) (232,812.)

16,736. "Electric discharge tubes having an incandescent cathode, an anode capable of being cooled, and one or more grid electrodes." Naamlooze Vennootschap Philips' Gloeilampen-Fabrieken. July 13th, 1923. (219,613.)

17,292. "Arrangements for charging and regulating the voltage of secondary batteries." Western Electric Co., Ltd. (S. V. C. Scruby). July 18th, 1924. (232,824.)

18,118. "Electric locomotives and other electrically-propelled vehicles." A. H. Jackson. July 28th, 1924. (232,829.)

18,410. "Means for mounting wireless aerials and the like on roofs." F. R. R. J. Pearce. August 1st, 1924. (232,832.)

20,611. "Electric discharge tubes having an incandescent cathode and an anode." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 2nd, 1923. (Divided application on 216,896.) (221,231.)

21,034. "Electrical heating elements." W. Joice. September 5th, 1924. (232,848.)

21,295. "Trolley wheels or pulleys for collecting electricity." C. F. Erlangsen. September 9th, 1924. (232,849.)

22,455. "Electrolytic cells." Electrizitats-Akt.-Ges. Schuckert & Co. October 3rd, 1923. (222,856.)

22,582. "Electric cable." Soc. Electro-Cable. December 21st, 1923. (226,495.)

22,669. "Means for actuating gas valves and electric switches by clockwork." F. Chambre. September 27th, 1923. (222,491.)

23,180. "Trolley poles for electric vehicles." A. J. Ablitt. October 1st, 1924. (232,861.)

23,815. "Compensated alternating-current motor for single or polyphase current, with different brush positions for clockwise or anti-clockwise rotation." Deutsche Werke Akt.-Ges. October 18th, 1923. (223,556.)

28,288. "Wave eliminator for wireless receivers." M. A. Mutchins. December 5th, 1924. (232,877.)

29,205. "Illuminating devices for medical purposes." G. Wolf Ges. December 21st, 1923. (226,521.)

## 1925.

166. "Control of overhead conductor points for railless vehicles." Brecknell, Munro & Rogers, Ltd., and A. M. Willis. January 2nd, 1925. (232,891.)

7,586. "Electron discharge apparatus." British Thomson-Houston Co., Ltd. December 21st, 1922. (Divided application on 208,728.) (231,188.)